PROMOTING APPROPRIATE TECHNOLOGICAL CHANGE IN SMALL-SCALE ENTERPRISES: AN EVALUATION OF APPROPRIATE TECHNOLOGY INTERNATIONAL

AID EVALUATION SPECIAL STUDY NO. 45
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PREFACE

The Agency for International Development (AID) has funded Appropriate Technology International (ATI) since its creation by the U.S. Congress in l977, first through a grant, and since September 30, 1983, by a Cooperative Agreement between ATI and AID's Bureau for Science and Technology. The Cooperative Agreement funds ATI's field program to develop and test strategies for delivering appropriate technology. Policy and technical information dissemination activities are also funded, but they are a small part of ATI's program.

In August l985 the AID Technical Manager for the Cooperative Agreement requested the Center for Development Information and Evaluation (CDIE) of the Bureau for Program and Policy Coordination to lead a mid-term evaluation of ATI. CDIE's topic coordinator for technology transfer and marketing agreed to lead this effort for several reasons:

-- First, ATI's basic approach to technology development and transfer emphasizes commercial viability and economic sustainability based on local skills, resources, and markets. This raises issues relevant to the ongoing CDIE technology transfer series, for example, what soft technology has ATI developed for exploring potential markets?

-- Second, ATI's mode of working through developing country cooperating organizations and private small-scale enterprises provides potentially useful lessons on linkage for AID and other donors. Are ATI's joint venture capital experiments a viable mechanism for direct AID assistance?

-- Third, the evaluation is timely. Other organizations in the world-wide appropriate technology movement have been examining their approaches in light of shortcomings in achieving widespread dissemination of appropriate technology; many of the past appropriate technology development and diffusion efforts have failed to adequately meet the needs of poor people, in terms of both what they will use and what they can sustain. Is ATI's newly focused approach the right direction?

-- Finally, ATI was created originally by the Congress to experiment with alternatives to AID's approach to technology development and transfer. How does ATI's approach really differ from AID's and is it more effective?

The evaluation, although at the mid-term of the Cooperative Agreement, comes at the juncture in ATI's history when the pressure on overall AID funding has led to declining budgets for ATI. Funds in the disbursement pipeline enabled the field program to be maintained at about the same level through December 1985. However, this situation is now changing, and basic questions of financing ATI's redirected program under the Cooperative Agreement must now be addressed.

CDIE developed a scope of work jointly with the Bureau for Science and Technology to evaluate ATI's field program in 10 countries and its overall performance under the Cooperative Agreement. Devres, Inc., a Washington-based consulting firm, was engaged to supply team members and planning and production services. CDIE arranged for travel for the three AID staff team members, and the Bureau for Science and Technology funded the contractor's work. Fieldwork was carried out in November 1985 and further interviews conducted through March 1986. This report reflects analyses and conclusions as of May 1985.

Substantial feedback from both partners in the Cooperative Agreement, ATI and the Bureau for Science and Technology, has been considered by the team in completing the field reports and this main report and appendixes. The field reports for each region are available as CDIE working papers. This main report is part of the CDIE series of special studies of technology transfer and marketing. It addresses the broader issues of targeted, market-driven development assistance specifically designed to bring about appropriate technological change, and the role of both ATI and AID in providing such assistance.

ACKNOWLEDGMENTS

We gratefully acknowledge the substantial contributions of the many people who have assisted this evaluation effort over the past year.

Ton DeWilde, ATI's Executive Director, supplied scarce resources to the task -- his own and his staff's time. Tom Corl and Eric Hyman organized ATI's participation and together with Cathy Fort, Marshal Bear, John Guy Smith, and Carlos Lola, supplied a wealth of briefing materials and valuable feedback to the evaluation process.

Within AID, Ed Smith, the Technical Manager of the AID Cooperative Agreement, has been a driving force behind the evaluation effort. His contributions included developing the scope of the evaluation, arranging the contract with Devres, Inc., and providing background and current AID management information to the team. The counsel of Dr. John Daly, Office of the Science Advisor, was much appreciated in light of his experience leading AID's l982 evaluation of ATI.

Devres, Inc., under a contract with the Bureau for Science and Technology, supplied small enterprise expertise for the evaluation team, including the expert advice of its Vice President, Dennis Wood, and consultants Carl Liedholm, Dwight Marburger, Howard Pack, and Wayne Dunlap. Preparation of the Working Papers evaluating ATI's regional programs in Africa, Asia, and Latin America and the Caribbean has been the responsibility of team members visiting each region. We gratefully acknowledge the assistance of John Kean in managing the overall Devres support of the evaluation effort, and in particular appreciate the Devres production staff work in preparing these regional reports.

The field evaluation effort would not have been possible without the excellent cooperation shown by ATI's implementing organizations in the 10 countries visited by the evaluation team. The entrepreneurs in the ATI-assisted productive enterprises were primary informants to this evaluation process. USAID Mission staff cooperated in the evaluation effort, and in particular, Tony Pryor at REDSO East Africa was helpful.

Preparation of this main report has been the primary responsibility of the CDIE topic coordinator for the technology transfer series in his role of ATI evaluation team leader. Antonio Velasquez of the Latin America Bureau, who led the evaluation of the ATI program in Latin America and the Caribbean, and Allen Turner of Devres, the principal author of the Asia program evaluation, both made substantial contributions to this effort. Dennis Wood has substantially assisted the drafting of this main report by providing the perspective gained from his participation in the l982 ATI evaluation, and many other AID evaluation efforts covering technology and small-scale enterprises.

Finally, typists Pamela McDade and Pat Brown and graphics specialist Robert Baker suffered through the preparation of many drafts, and we gratefully acknowledge their contributions and perseverance.

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SUMMARY OF FINDINGS AND RECOMMENDATIONS

ATI's Mission, Approach, and Current Status:

- -- The mission of ATI is to experiment and to develop innovative approaches to technological development and the transfer of new technologies.

- -- ATI's approach relies on directly involving developing country organizations and entrepreneurs in its activities.

-- ATI's portfolio of field projects is focused both technically and geographically.

-- Overall, ATI has made major progress, but it has some remaining weaknesses to overcome if it is to realize its potential.

Evaluation Results:

-- ATI has positively changed its operations in all areas specified in the Cooperative Agreement, meeting all the quantifiable process-oriented performance targets.

-- The direction, quality, and impact of ATI's hard and soft technology development activities have generally improved, but not uniformly in all of its projects.

-- ATI's efforts to strengthen implementing organizations has focused sharply on increasing their capacity to develop and transfer technology. However, ATI needs to better assess any shortcomings in the implementing organization during project planning.

-- ATI has significantly improved its project planning process, including technical and commercial appraisals, but market analysis needs more careful attention.

-- ATI has increased its capability in commercial analysis, although further improvement and consistent application are needed.

-- The evaluation team found differences in ATI's regional programs. Team members drew different implications from the findings based on the field visits to the Latin America and Caribbean region.

-- ATI manages its field operations to allow for a responsive, flexible, and adaptive working style by the regional teams. This approach has some advantages, but it has the disadvantage of weakening ATI's ability to learn systematically from its achievements and mistakes.

-- ATI's monitoring and evaluation systems should be revised and integrated with planning and field project supervision.

-- ATI has not systematically identified and disseminated lessons learned from its experience.

-- ATI's unique role in economic development assistance is to link appropriate technology and small-scale enterprise development in a learning and experimental framework. ATI's mandate is to take risks that have a potentially large payoff. It is not expected that each

one of these risky projects will be successful.

-- ATI's projects under the Cooperative Agreement had not matured enough to provide many benefits to the poor by the time of the evaluation.

-- ATI has strengthened its capability to promote private initiative but has not applied this capability fully in all its projects.

-- The Cooperative Agreement has served to redirect ATI priorities, but some aspects of the AID system and oversight imposed by the Cooperative Agreement impede the achievement of ATI objectives.

-- ATI's core financial support from AID has declined, and ATI has not been successful in diversifying its sources of funding.

-- ATI and USAID Missions have complementary interests and contrasting efforts; they could learn more from each other, but communications must first be improved.

-- ATI's concentrated attention to the replication of hard technologies has diminished other important aspects of its mission, particularly innovative soft technology development and transfer.

Recommendations for ATI:

-- Improve its technical and commercial appraisals in project planning and implementation.

-- Place a higher priority on the further development, adaptation, and transfer of soft technologies, such as market and risk analysis, in its projects.

-- Improve the management of field operations.

-- Improve its monitoring and evaluation of demonstration projects.

-- Strengthen its replication plans and efforts to disseminate lessons learned.

-- Maximize the impact of its activities on its targeted beneficiaries.

-- Consider mid-course adjustments and improvements that will enable it to be more cost-effective.

Recommendations for AID:

-- The oversight role of the AID Bureau for Science and Technology in assisting ATI to successfully focus its program and significantly improve its project approach

can move to a more detached phase.

-- AID should provide a stable level of core financial support for ATI during the remainder of the Cooperative Agreement to enable ATI to diversify its sources of funding and sustain the progress it has made under the Cooperative Agreement.

GLOSSARY OF ABBREVIATIONS

AID - Agency for International Development

ARIES - Assistance to Resource Institutions for Enterprise Support

ATI - Appropriate Technology International

CDIE - Center for Development Information and Evaluation, AID

KENGO - Kenya Energy Non-Governmental Organizations

LAC - Latin America and Caribbean

NGO - nongovernmental organization

PPC - Bureau for Program and Policy Coordination, AID

PVO - private voluntary organization

S&T - Bureau for Science and Technology, AID

RD - Office of Rural and Institutional Development, AID/S&T

USAID - U.S. Agency for International Development field Mission

1. ATI'S MISSION, APPROACH, AND CURRENT STATUS

1.1 ATI's Mission

The mission of ATI is to experiment and to develop innovative approaches to technological development and the transfer of new technologies.

Appropriate Technology International (ATI) is a private, not-for-profit development assistance organization located in Washington, D.C. It was established in 1976 by mandate of the U.S. Congress. ATI was funded initially for 1 year with a $1 million organizational grant; this was followed by a 3-year, $20 million grant, which was later extended to September 1983, with total funding of $23.7 million. All funding has been through the Agency for International Development (AID). Since

September 30, 1983, ATI has been funded by a 3-year, $16.5 million Cooperative Agreement between ATI and AID. The Bureau for Science and Technology of AID has oversight over the Cooperative Agreement.

This report covers the findings, conclusions, and recommendations of a mid-term evaluation of ATI, carried out by AID's Center for Development Information and Evaluation and Devres, Inc. in the field and in Washington from November 1985 to March 1986. Findings and conclusions in this main report are supported in appendixes addressing key issues and in three working papers covering field evaluations of ATI's regional programs in Africa (Delp and van Blarcom 1986), Asia (Turner and Ulsaker 1986), and Latin America and the Caribbean (Velasquez and Halvorson 1986).

Congress' intent in establishing ATI was to provide an alternative approach to solving some of the problems associated with technological development activities funded under the Foreign Assistance Act. Section 107 of the Act called for an experimental approach. AID's response to the Congress in 1976 cited the ambitiousness of the goal to develop and disseminate appropriate technology:

> A great deal of experimentation, learning from experience, and innovations in approaches to the problem as well as specific innovations in technology are required....
>
> The program is intended to serve not just as a funder of privately run projects, but as a source of experimentation, evaluation and ideas in appropriate technology which can be picked up by developing country governments and aid donors or be spread by private enterprises.... (AID 1977, 21-22).

ATI strove for 5 years to fulfill this mandate, branching off in diverse foreign and domestic programs. A 1982 AID evaluation of ATI cited ATI's reasonable success in strengthening institutions, but noted that a core technology was not apparent in approximately 40 percent of ATI's grants. Direct services by ATI (e.g., channeling funds to small-scale enterprises) were judged inefficient. Although ATI's broader experimental and dissemination role was acknowledged, overall the program through 1982 had not been cost-effective (AID 1982, v, 45, 65).

Thus, AID aimed to redirect and to focus ATI's activities while preserving its operational autonomy. AID planned to influence ATI's mission and strategies through a collaborative relationship under a Cooperative Agreement. AID and the new ATI management negotiated this Agreement in 1983. It established a new orientation for the organization. ATI's newly defined mission is as follows:

> To implement programs that demonstrate the utility and

> cost-effectiveness of development strategies directed towards rural and semi-urban areas, which disseminate commercially viable and economically sustainable technologies adapted to the resource endowment of the rural and semi-urban poor, and to facilitate use of these development strategies by other organizations on a wider scale (ATI 1986, 1).

1.2 ATI's Approach

> ATI's approach relies on directly involving developing country organizations and entrepreneurs in its activities.

ATI carries out a project{1} through an implementing organization in a developing country. The projects attempt to demonstrate the commercial viability and economic sustainability of appropriate technologies. Figure 1 illustrates the basic relationships in this process from a technology transfer perspective. It depicts primary linkages among ATI and its cooperating organizations in moving technologies from one or more technology sources to end-users of the products or services that result from transfer of the technology. The following paragraphs briefly describe the operational approach (see also Appendix A).

Through a project grant to an implementing organization, ATI finances one or more productive activities or enterprises. These productive enterprises utilize the core technology in one or more ways, including manufacturing (e.g., fabricating an oil press), processing (e.g., using the press to produce cooking oil), and distribution (e.g., supplying presses to other enterprises; supplying oil to consumers). Other organizations may cooperate in the project as intermediaries in technology development, adaptation, or the technology diffusion process.

Each ATI project under the Cooperative Agreement involves a core (hard) technology and associated soft technologies (e.g., management procedures, repair and maintenance skills, financing procedures, or marketing techniques). The objective is for the productive enterprise in a project to employ the core technology, which has been adopted to the setting and integrated with relevant soft technologies, in a profitable business. For example, a ceramic-lined cookstove was successfully developed in Kenya by adapting a clay bucket stove design from Thailand to the traditional Kenyan charcoal-burning stove built from scrap metal. In accordance with the ATI project plan, the implementing organization contracted with a local small-scale enterprise (the intermediary) to make and distribute samples and to select and train potters to make the clay lining (the productive activity). The intermediary contracted with entrepreneurs in rural market places (also productive activities) to assemble and sell the stoves. Both the implementing organization and the intermediary share responsibility for monitoring quality, which is a major determinant of widespread adoption of the cookstove.

ATI uses the experience gained in undertaking projects to identify, adapt, test, demonstrate, and disseminate core and soft technologies. In particular, it seeks to promote strategies for (1) purposeful use of proven commercially viable technologies by small-scale enterprises, (2) diffusion of hard and soft technologies among other small-scale enterprises, and (3) expansion of benefits for the rural and semiurban poor.

{1}The Cooperative Agreement refers to ATI's "projects" as "subprojects." This report adopts the ATI designation of "project."

1.3 ATI's Current Status

1.3.1 Portfolio of Field Projects

ATI's portfolio of field projects is now more focused both technically and geographically.

By December 1985, 36 projects had been initiated under the Cooperative Agreement. ATI's portfolio had a mix of projects that was appropriate for achieving its objectives. The number of projects per year was smaller than in the period prior to the Cooperative Agreement, but average grant size was larger (see Appendix D). ATI also worked in fewer countries (20) under the Cooperative Agreement than before (45). Each project emphasized a core technology in one of the following priority technical fields: agricultural products processing, local mineral resources, and equipment and support for small farms. (See Table 1 for specific examples of core technologies.) Agricultural processing core technologies received 63 percent of ATI's funds, followed by mineral resources, which accounted for 19 percent. Two projects, classified as "truly unusual development opportunities," received a funding allocation of less than 9 percent.{2}

ATI's portfolio of projects has included a variety of innovative elements in both hard and soft technologies. However, it was not until late 1985 that ATI began to formally designate the innovative aspects of its projects as an outgrowth of its new accountability for promoting the replication of its projects (see Appendix H). Innovative aspects were identified in products, production processes, and dissemination mechanisms and procedures. In the area of hard technology, the improvement, manufacture, and distribution of intermediate goods was a frequent innovation; down-scaling an existing technology was another. Soft technology innovative elements were diverse, for example, improved input distribution methods, quality improvement procedures, marketing mechanisms, and financial or organizational arrangements. (Appendix D describes this analysis in detail.)

ATI's mix of 58 project cooperating organizations (implementing organizations and other intermediaries) was adequate for demonstrating strategies for using and disseminating technologies to benefit the rural and semiurban poor (see Appendix E). As of the end of 1985, 47 percent (27) of ATI's cooperating organizations were private voluntary organizations that focused on small-scale enterprise development. Almost one-third (18) were private companies. Twenty-nine percent (17) of the cooperating institutions, including 10 private voluntary organizations, were technology development and dissemination organizations.{3} Less than 12 percent of ATI's selected cooperating organizations were social or community development organizations; ATI assisted several of these to begin promoting economic and technology development activities for the poor (see Appendix F).

Table 1. Examples of Core Technologies in Priority Technical Fields

Agricultural products processing and use of agricultural wastes

-- Small-scale pressing and extraction of edible oils such as palm and sunflower
-- Processing of cereals and staple foods such as the milling of sorghum or millet
-- Production of animal feed from agricultural wastes and from plants specially grown for feed
-- Processing of fruits and vegetables
-- Production of weaning foods and nutrition supplements
-- Utilization of agricultural wastes such as briquetting of coffee and cashew nut hulls
-- Upgrading of traditional wool and cotton spinning and weaving techniques

Local mineral resource technologies

-- Small-scale production of cement and cementitious material, such as lime-pozzolana mixtures
-- Ferro-cement applications such as water tanks and roofing sheets
-- Small-scale production and utilization of lime
-- Production of clay products such as ceramics, bricks, and tiles, as well as the improvement of production methods such as ovens and kilns
-- Processing of small deposits of rock phosphate into fertilizer
-- Production and use of stabilized earth blocks
-- Production of adobe-based building materials

Equipment and support for small farms

-- Manufacture of hand tools
-- Production and marketing of rural transport equipment such as oxcarts and other animal-drawn implements

-- Water catchment, storage, and delivery systems such as the dissemination of small-scale rainwater catchment tanks
-- Production and marketing of small farm implements and machinery developed by research institutions such as the International Rice Research Institute (e.g., for small-scale application of fertilizer)
-- Use of biotechnologies to produce rhizobium inoculants or to process cassava into high protein animal feed

Source: Adapted from Appropriate Technology International, "Annual Workplan," Appendix C, 1986.

The field evaluation of ATI was carried out in November 1985. Evaluation results reflect the team's perspective: a review of ATI's activities up to that time. The evaluation covered 18 of ATI's 36 projects in three regions and 10 countries (see Table 2). Because productive activities had not yet begun under most of the projects, this review concentrated on evaluating ATI's capabilities in pre-investment assessment, such as appraisals of the technical and commercial potential of the projects. (Appendix B describes the evaluation approach; Appendix F gives specific findings from the field visits.)

{2}This latter category was allowed under the Cooperative Agreement to give ATI some flexibility in pursuing innovative opportunities.

{3}This categorization, based on data supplied by ATI, characterizes cooperating organizations by a number of attributes, and thus the categories are not mutually exclusive.

1.3.2 Progress and Remaining Weaknesses

Overall, ATI has made major progress, but it has some remaining weaknesses to overcome if it is to realize its potential.

Overall by the midpoint of the Cooperative Agreement, ATI has demonstrated that it has made progress in focusing on the technology transfer and adaptation process as envisioned by the Congress and funded by AID. For ATI's past progress to be further bolstered and its potential to be fully realized, stable core financial support by AID is necessary. Continued Bureau for Science and Technology funding or funding by other AID or private sector sources is essential if ATI's activities are to continue to benefit those it assists.

ATI occupies an important niche in economic development assistance: linking appropriate technology transfer with small-scale private enterprise promotion in an experimental field demonstration mode. In many respects, ATI's cost-effectiveness is not directly comparable to that of other organizations involved in technology for development, nor was such a comparison

a part of the scope of work for this evaluation. Thus, cross-organizational comparisons would not be valid nor would they be nearly as important as identifying ways ATI can use its resources to increase the output of the desirable outcomes it seeks to achieve.

ATI's redirected and refocused program, which Bureau for Science and Technology and ATI management have forged, is a significant step in the desired direction, but it has not led yet to the realization of all the benefits intended from ATI activities. This slow progress is attributable in part to the short time that has elapsed since the beginning of Cooperative Agreement-directed efforts. However, the flow of some of the expected benefits (e.g., of lessons learned) from ATI's activities also has been slowed by ATI organizational systems and practices. Despite major changes under the Cooperative Agreement, ATI needs further improvements, particularly in strategies for appraising the state of development of specific core technologies and the market.

Table 2. ATI Cooperative Agreement Projects Visited by the Evaluation Team

Region/ Country	Productive Activity	Priority Tech. Fielda	Implementing Organizationb	Obligation Date (mo./year)	Funds Grant ($,000)	Dis-bursd	Term Months (Mos.)	Elapsc
Africa								
Botswana	Animal-Driven Pumps*	ESF	RIIC/RIP	10/83	108.0	90.7	36	25
Botswana	Brick Production*	LMR	MHT/SRDA	06/84	90.4	28.7	36	16
Botswana	Lime Production	LMR	MHT/SRDA	12/84	95.0	42.3	36	10
Botswana	Grapple Processing	APP	T-L	03/85	37.1	6.0	36	7
Tanzania	Oil Press Production*	APP	CAMARTEC	06/84	112.3	112.0	38	16
Tanzania	Rural Potteries*	LMR	CAMARTEC	06/84	97.5	93.2	38	16
Tanzania	Improved Bricks	LMR	CAMARTEC	11/84	156.5	99.2	37	12
Tanzania	Village Oil Processng	APP	LWR/ELCT	11/84	142.7	80.1	52	12
Kenya	Ceramic-Lined Cookstves	LMR	KENGO	05/85	254.1	43.5	38	5
Asia								
Thailand	Rhizobium Inoculant*	ESF	SVITA	04/84	137.7	91.7	32	18
Thailand	Rural Small-Scale Industries Bamboo Grass Mats	APP	PDA	11/84	310.7	41.6	72	12
Thailand	Protein-Enriched Cassava	APP	PDA	07/84	210.3	63.2	31	15
Philippines	Rural Small Industries* Development Mushroom Growing Coconut Processing	APP	FFI	03/85	367.4	0	50	8
Nepal	Wool Spinning	APP	ACP	12/84	165.1	45.4	48	11
Nepal	Turbine Agro-	APP	NEW ERA	01/85	30.0	10.8	36	10

	Processing							
Latin America/Caribbean								
Costa Rica	Lime Kiln Technology*	LMR	C/ITCR	05/84	144.5	40.4	29	18
Dom. Rep.	Swine Feed Technology*	APP	CIMPA	06/84	161.0	64.1	30	17
Regional	Wheelchairs:*	TUO		12/84	300.8	98.1	24	11
Honduras	Honduras Site	FUHRIL		07/85	9.0	6.3	18	4
Guatemala	Guatemala Site	CERVOC		07/85	6.0	4.0	18	4

*Projects designated by ATI for mid-term evaluation.

aPriority technical fields are as follows: APP = agricultural products processing and agricultural waste utilization; ESF = equipment and support for small farms; LMR = local mineral resources; TUO = truly unusual opportunity.
bImplementing organizations are described in Appendix E.
cAs of October 31, 1985, the time of the field visit.

ATI has demonstrated that it has the potential to make the contributions that the Congress and AID intended. This potential is evident in the following primary characteristics of its portfolio of projects since the Cooperative Agreement:

-- Innovative elements in each project and in the core technologies in a priority technical field

-- Productive activities with a good potential for commercial viability and economic sustainability

-- Capable cooperating organizations that reach the poor through their support of small-scale enterprises

To attain its potential, ATI must give priority to overcoming the following specific weaknesses:

-- An inadequate framework for systematically identifying, evaluating, and disseminating lessons learned from its experimental efforts for the benefit of others

-- Insufficient attention to systematically identifying the innovative aspects of its projects and relating them to its experimental mission

-- Inadequate appraisal of the state of development of specific core technologies and the market for them

-- Lack of organizational systems and practices that would strongly support the flow of benefits expected from ATI activities (e.g., lessons learned, innovative aspects of

projects, and new funding sources)

-- Inability to diversify its sources of funding

AID also needs to make adjustments in its relationship with ATI. The Bureau for Science and Technology needs to allow ATI the flexibility to formulate improvements and implement its program. The Bureau must act promptly to remove bottlenecks that inhibit ATI's experimental and innovative approaches in demonstrating cost-effective strategies for bringing the benefits of technology to the rural and periurban poor.

If ATI and AID make concerted efforts to address these matters during the remaining life of the Cooperative Agreement, ATI's progress and effectiveness will be substantially improved.

2. EVALUATION FINDINGS

2.1 ATI's Changes To Meet Performance Targets

ATI has positively changed its operations in all areas specified in the Cooperative Agreement, meeting all the quantifiable process-oriented performance targets.

The Cooperative Agreement established performance targets for ATI that reflected changes in priorities and operations. The quantifiable performance targets (and achievements as of December 31, 1985) were as follows:

-- 45 field projects underway in 36 months. (ATI had 36 field projects in 28 months -- a slightly higher rate of project funding -- see Appendix D.)

-- 89 percent of AID financial assistance funds committed to projects in priority technical fields. (ATI committed 91 percent -- see Appendix C.)

-- 50 percent of AID funds committed to projects in developing countries. (ATI had spent greater than 51 percent -- see Appendix C.)

-- 75 percent of funds spent on field projects and supporting activities. (ATI had spent 84 percent.)

-- 75 percent of ATI's project implementing organizations to be small-scale enterprises or organizations focusing on small-scale enterprises. (Nearly all of ATI's project partners are small-scale enterprises or organizations focusing on small-scale enterprise technologies or economic development -- see Appendix E.)

These quantitative targets are essentially process oriented rather than results oriented.

It is too early to state unequivocally whether ATI has met Cooperative Agreement performance targets such as balancing technology and institutional considerations, acting as a catalyst to the key appropriate technology process, and replicating innovative elements. Changes in ATI's priorities and operations indicate that serious attempts are being made to meet the targets in all areas specified, but areas needing significant improvement were identified during this evaluation.

In contrast to its pre-Cooperative Agreement performance, a reorganized and more technically competent staff provides direct support to field officers, cooperating organizations, and occasionally to productive enterprises. Since the Cooperative Agreement was signed, ATI has reduced its staff from 64 to 42 positions, placing increased emphasis on specialists rather than generalists (see Appendixes C and G). Most of its implementing organizations work directly with small-scale enterprises. The evaluation team identified aspects of ATI projects that entailed some risks, but overall the projects had potential for commercial viability and economic sustainability. Among the experimental and risky, yet promising, ventures are rhizobium inoculant and protein-enriched cassava in Thailand, lime kiln technology in Costa Rica and Botswana, local processing of grapple (a medicinal root crop) in Botswana, oil seed processing in Tanzania, and ceramic-lined cookstoves in Kenya. (See Appendix F for elaboration of these findings and conclusions.) With the increasing emphasis on a core technology, the balance between ATI's technology and its institutional development activities has been improved. ATI has increased its ability to assess technology and probably to replicate successfully demonstrated productive activities.

2.2 Hard and Soft Technology Selection and Transfer

The direction, quality, and impact of ATI's hard and soft technology development activities have generally improved, but not uniformly in all of its projects.

As Congress and AID intended, ATI has experimented in innovative technologies that have high potential payoffs and that may also have high risks. Generally, ATI's projects have established productive activities with good prospects for commercial viability. Some projects include significant uncertainties, for example, in input supply and product markets. These projects have slightly less promise of sustaining the economic benefits from the productive activities. For example, the commercial success of the ATI-financed coconut processing enterprises in the Philippines will depend on their effective entry into local market niches already penetrated and often dominated by well-established larger players. Although the lower production costs and improved quality resulting from the new technology promise higher profits, these factors are not alone sufficient. Effective smarket strategies must also be developed for small-scale processors in order for the technology to be widely disseminated.

In ATI's view, if there were no significant uncertainties associated with the productive activities, the private sector could undertake them without support from an outside organization. ATI plays a useful role in demonstrating that the uncertainties can be overcome, thus enabling others to consider replicating the technology. Such levels of risk are appropriate according to ATI's mandate.

ATI's approach to hard and soft technology selection is appropriately situational, depending on the setting and actors involved. It relies considerably on the experience of its project officers, its Evaluation and Technical Development Group, and its implementing organizations. For example, most of ATI's projects in local mineral resources were in Africa, due in part to the project officer's keen interest in this field. In Thailand, two of the three projects visited deal with microbiological processes, which benefit from strong local expertise and interest in this area. However, in several projects, ATI has not accurately assessed the stage of development of the technology, and, as a result, project implementation schedules have not been realistic (e.g., the Botswana animal-driven pump project -- see Appendix F).

ATI has been more active in soft technology transfer because its project implementing organizations generally have not been strong in this area. The exception are two organizations the team visited in Asia, which are larger than the others and have significant staff capabilities. ATI activities aimed specifically at strengthening the capabilities of its implementing organizations to transfer supporting technologies, both hard and soft (e.g., inventory control, facilities layout, financial systems), have been unevenly applied. Projects visited in Asia and Africa had made more progress in this regard than those visited in Latin America and the Caribbean (see Section 2.6).

2.3 Strengths and Shortcomings of Implementing Organizations

ATI's efforts to strengthen implementing organizations have focused sharply on increasing their capacity to develop and transfer technology. However, ATI needs to better assess any shortcomings in the implementing organization during project planning.

ATI generally selected implementing organizations based on their capacity to manage, the appropriateness of their technical skills or access to them, and their willingness to carry out disciplined commercial and technical analyses and monitoring. ATI encouraged implementing organizations to draw on the skills or experience of other local organizations or individuals to support them in areas in which they are weak. With the notable exception of projects visited in the Latin America and Caribbean region, ATI worked well to fill gaps in implementing organization capabilities to perform commercial and technical analyses. However,

it relied too heavily on the implementing organizations in sociotechnical aspects. It often simply assumed a sensitivity on the part of implementing organizations toward cultural issues affecting user adoption. In some cases, such as the wool spinning project in Nepal, the mix of organizations and feedback procedures was effective. In one or two projects, such as the animal-driven pump project in Botswana, both the implementing organization and ATI failed to give sufficient attention at an early stage to the importance of social organization in developing the technology (see Appendix F).

2.4 Improvements to Project Planning and Appraisal

ATI has significantly improved its project planning process, including technical and commercial appraisals, but market analysis needs more careful attention.

ATI's identification and planning of potential projects, criticized in the 1982 evaluation, has improved considerably. Project plans are now comprehensive documents prepared by the regional teams and reviewed through a formal project approval process. The Project Review and Advisory Committee -- composed exclusively of outside experts -- provides valuable advice (see Appendix C).

ATI has increased its capability in technical appraisal by relying on a mix of staff technical specialists, use of local technical specialists in each country, and, less frequently, outside consultants. Given the uncertainties often encountered in developing a technology, several of ATI's projects would have benefited from more independent appraisal of potential by outside experts and more frequent cross-checking of the status of the technology. Seven of the 36 projects provided for studies by outside consultants. Only a few of the projects visited by the evaluation team (e.g., rhizobium inoculant in Thailand and lime kilns in Costa Rica) planned for implementation in stages that allowed for "go/no go" decisions on continuing the technology development. For example, in the Asia region's protein-enriched cassava project, ATI technical staff were brought in periodically as needed. However, intermediate checkpoints were not established prior to ATI's final go/no go decision to move on to commercial operation. Other projects would have benefited from more realistic time frames based on sounder initial technical assessments.

2.5 Needed Improvements in Commercial Appraisal

ATI has increased its capability in commercial analysis, although further improvement and consistent application are needed.

ATI's Asia Program has developed business planning models

that identify, quantify, and help control the risks involved in new technology ventures. These have been applied well in many of its projects, for example, the venture capital projects visited in the Philippines and Thailand. However, it has not applied these uniformly in all of its projects, although elements of business planning had been incorporated in ATI's revised project plan format. ATI has found its commercial analysis manual based on break-even analysis (prepared in 1983) to be a useful, but incomplete tool, but it has not yet devoted the resources necessary to revise, field test, and send out for critical review an improved version (see Appendix G). Commercial analysis in the projects visited ranged from crude calculations to detailed monthly cashflow analyses for the various productive enterprises. Commercial analyses for projects visited in the Latin American region were generally weaker than those in other regions, although the more recent plans show improvement. Project plans in Asia and Africa were based on a more consistent effort to analyze both technical and commercial risks, profit ability, and some market considerations (see Appendix F).

The adequacy of the commercial analysis was frequently correlated with the attention paid to marketing factors. ATI has not developed marketing strategies nor has it applied planning procedures for market development across all of its projects. A systematic market study should be a priority task in project development, and not contingent on first proving technology operating levels (e.g., volume and quality of product). In general, the product quality that meets the market's demand provides a target for gauging the development of the technology, as occurred in the protein-enriched cassava project. Given the importance of product quality to market- ability and the significance of quality improvement innovations in ATI's portfolio, market analysis needs more careful attention.

Several projects did not adequately analyze the demand for the technology or its products (animal-driven pumps in Botswana, lime kilns in Costa Rica, and the Latin America and Caribbean regional wheelchair project) or the supply of necessary inputs (for the swine feed project in Dominican Republic and the lime kiln project in Costa Rica). Market planning (e.g., how to capture a share of the market) was inconsistently applied and, in general, needed more timely effort.

2.6 Weaknesses in Latin America Projects Evaluated

The evaluation team found differences in ATI's regional programs. Team members drew different implications from the findings based on the field visits to the Latin America and the Caribbean region.

Although the organizational structure of ATI's field operations was standardized across regions under the Cooperative Agreement (see Appendix C), distinct differences influenced ATI's project portfolio and field operations in each region. These

include the following:

-- Socioeconomic, cultural, and political factors

-- The capabilities and operating styles of cooperating institutions

-- The interests and experience of ATI staff in each region

Together these factors explain the observed unevenness of ATI's performance, which was most noticeable in the Latin America and Caribbean region.{4} The three projects evaluated in this region showed generally weaker planning and implementation than did projects in Africa and Asia. Weaknesses included inadequate pre-investment appraisals of markets, commercial viability, sources of supply, and the like. Soft technologies for business and project management had not been provided to implementing organizations that needed them. These shortcomings were especially evident in the regional wheelchair project.

The evaluation team's opinions were divided on the implications of these findings. The leader of the Latin America and Caribbean region field visits believed that the weaknesses in the projects visited there were symptomatic of basic structural and functional problems of ATI as a whole for which ATI's senior management must bear responsibility. (The specific findings are provided in the Latin America and the Caribbean region evaluation working paper (Velasquez and Halvorson 1986);5 the broader

4The evaluation team split up to visit each region, and thus perceived differences may be attributable in part to individual differences among the team members. Appendix B describes the design for controlling the effects of individual biases.

5ATI's rebuttal to these conclusions emphasized improvements over time: "more recent projects, in Peru, for example, show more comprehensive appraisals of market and commercial viability than certain wheelchair subprojects." (Appropriate Technology International, "General Comments on the Main Report Draft of the Mid-Term Evaluation of ATI," p. 3).

implications of this interpretation are discussed in a separate memorandum by the leader of the regional evaluation (August 11, 1986)). The other evaluation team members believed that the more negative findings for these projects compared with the findings from the other regions were not representative of ATI field operations in general, only acute examples of some of the kinds of weaknesses that this report recommends correcting.

2.7 Flexible Management of Field Operations

ATI manages its field operations to allow for a responsive, flexible, and adaptive working style by

the regional teams. This approach has some advantages, but it has the disadvantage of weakening ATI's ability to learn systematically from its experience.

ATI values a flexible, personal management approach internally and in working with its cooperating organizations. It nurtures a special relationship with each implementing organization, which in many cases predates the start of the Cooperative Agreement. This flexible management approach has been effective in resolving bottlenecks and occasional crises in implementing projects. In some cases it has resulted in a better match between projects and local input or market situations.

ATI's flexible management style has been accompanied by some loss in overall organizational effectiveness. Senior management has found itself drawn into day-to-day operations, remedial actions, and general crisis handling. The evaluation team sees a need for more consistent and explicit administrative requirements and procedures to guide fieldwork. The need for basic guidelines and common procedures was most apparent in the Latin America and Caribbean region, where a consistent discrepancy was noted between stated organizational approach and actual practice. While ATI has effectively learned by doing in many instances, lessons learned were not being distilled and could well be lost. Turnover in the field staff underscores the need for a set of administrative procedures to document progress, critical milestones, and deviations from plan. Project officer's trip reports and monthly reports from regional programs were found by the evaluation team to be inadequate for achieving these requirements. Development of these procedures will require ATI to reexamine its priorities with respect to the management, information, and evaluation systems necessary to improve documentation.

2.8 Inadequate Project Monitoring and Evaluation

ATI's monitoring and evaluation systems should be revised and integrated with planning and field project supervision.

ATI's grants management procedures established under the Cooperative Agreement were achieving their intended purpose: greater control over contract finances. The quarterly reporting system functioned as well as could be expected, given that the first link in the chain of financial information is a developing-country implementing organization with its own accounting system. Several implementing organizations reported that while ATI's requirements were cumbersome, the discipline imposed was beneficial.

ATI expended considerable effort in developing its Project Monitoring and Evaluation System for "monitoring, ongoing evaluation and expost evaluation of appropriate technology

projects" (Hyman and Corl 1985). Its principal purpose is to assist in the analysis of the commercial viability of productive activities supported by ATI projects. The focus of the comprehensive 18-page checklist of questions is essentially quantitative (see Appendix G).

However, this Project Monitoring and Evaluation System is neither a monitoring system nor an effective evaluation system. It is not used by ATI's project officers in planning or implementation. The system is not linked either to project plans or to status reports (e.g., trip reports and implementing organization quarterly reports), nor does it provide a historical record of the "appropriate technology process" underlying each project. ATI's system inadequately treats institutional selection issues, key decisions, and options considered. The resulting lack of documentation of lessons learned is a weakness in ATI's replication strategy.

ATI's trip reports vary widely in format, coverage, and timeliness.{6} Critical indicators are not systematically signaled and followed up. ATI has generally succeeded in getting implementing organizations to provide standardized quarterly progress reports as provided for in the Cooperative Agreement.

Overall, ATI's systems and procedures do not adequately fulfill the objectives of managing implementation and providing the historical record from which lessons can be readily extracted. Problems are (1) linkage among the various reporting and documentation elements signaling critical indicators, (2) insufficient attention to scheduling and time factors, (3) no centralized project file, and (4), with the notable exception of technical issues, limited discussion of options and alternatives concerning the projects.

{6}As of January 1986, a more consistent approach was introduced, modeled on Africa region trip reports.

2.9 Dissemination of Lessons Learned

ATI has not systematically identified and disseminated lessons learned as a result of its experience.

Because it learns by experimenting commercially in the marketplace, ATI's principal value and leverage in the development process is its ability to identify and disseminate information on both successful (commercially viable and economically sustainable) and unsuccessful efforts in appropriate technology development and transfer. Its project portfolio, mix of cooperating organizations, and unique strategy elements create a sound basis for marketplace experimentation with the development and transfer of technology for the poor. ATI has used this combination of factors to advantage in identifying technologies and moving them into productive use for the benefit of the poor. Thus, ATI's role as an organization that identifies and

disseminates lessons learned is essential if the successes and failures of its demonstration projects in the marketplace are to be absorbed, adapted, and applied by others.

ATI has not yet sufficiently documented its progress in terms of lessons learned to provide others with the benefit of its experiences. For example, ATI has not systematically identified innovative elements of a project and related them to other project aspects. Its Project Monitoring and Evaluation System was not designed to track and relate project decisions and results, nor to distill lessons learned about the development, transfer, and replication of innovative project elements. The individual discretion given ATI project officers compounded the impact of this failure to document field experience systematically. Discrepancies between ATI's stated approach and project officers' actions in the field (e.g., in Central America and East Africa) were not identified by the Project Monitoring and Evaluation System (see Appendixes F and G). Thus, while project officers individually might have learned from this flexible approach and its results, the lessons were not systematically captured for ATI as a whole or for the larger development community.

2.10 The Link Between Technology Transfer and Small-Scale Enterprise Development

ATI's unique role in economic development assistance is to link appropriate technology and small-scale enterprise development in a learning and experimental framework. ATI's mandate is to take risks that have a potentially large payoff. It is not expected that each of these risky projects will be successful.

ATI's strategy for transferring appropriate technology is to involve nongovernmental organizations in developing countries in productive and potentially profitable activities centered around a priority technical field. Many other development interventions have demonstrated appropriate technologies in developing country settings; hardware demonstration centers around the world testify to past devotion to this approach. However, these efforts have not led to widespread diffusion of the technologies because they lacked the soft technologies required to support a productive activity. ATI's approach integrates the hard and soft dimensions of technology transfer. ATI gains leverage by working through a variety of implementing organizations selected expressly for their commitment to economic development.

The second factor in ATI's potentially unique contribution is its small-scale enterprise orientation. Again, ATI's program is only one of a wide range of private voluntary organization, donor, and government programs to assist the smaller producer and entrepreneur. ATI's efforts stand out, alongside too few others, for their emphasis on combining a core technology in each intervention, focused technical assistance, and partnership with

local institutions. None of these elements alone is unique to ATI efforts, but ATI is uniquely positioned to contribute to linked appropriate technology transfer and small-scale enterprise development.

ATI can experiment in risky, high-potential efforts. Even a negative finding on a core technology in a demonstration project can provide valuable information that can help other donors, government agencies, and private investors avoid suboptimal investments. However, ATI's contributions must be documented and analyzed, and the resulting lessons widely shared, tested, and replicated by the development assistance community if ATI's ultimate goal is to be realized.

2.11 Potential Benefits to the Poor

ATI projects under the Cooperative Agreement had not matured enough to provide many benefits to the poor by the time of the evaluation.

Some new employment opportunities have been generated for the poor (e.g., in the bamboo grass mats project in Thailand), demand for some raw materials has increased (e.g., limestone will be gathered by the poor in Botswana), and a few intermediate goods (e.g., pig feed in the Dominican Republic) and consumer items (e.g., the Kenya cookstove) for the poor have been produced. These impacts were marginal and were not yet widely spread. However, ATI activities have the potential for significantly expanding these impacts.

First, the generation of widespread benefits is ultimately tied to the replication of the productive activities in each demonstration project outside the project's boundaries. For example, appropriate technology brickyard projects such as ATI has funded in Botswana and Tanzania create some jobs in periurban areas, but many brickyards would have to be started before there could be a significant generation of jobs.

Second, broadly based and significant impact depends on extracting lessons and applying them in technology delivery strategies. Direct benefits to the poor from ATI's technology development and transfer are likely to flow from the demand for labor or raw materials, and/or the supply of intermediate and consumer goods created by productive activities. Thus, to reach the poor to the maximum degree, the productive activities need to become commercially viable and economically sustainable by creating demand or supply requirements that directly affect the poor. Most ATI projects did not give the poor direct control of improved technology and were not designed to do so. However, ATI has both cottage industry and small industry levels of technology in its project portfolio that provide some opportunity for the direct participation of the poor. A common strategy for an ATI project is to promote productive technologies that can aggregate raw materials and markets for small-scale enterprises.

ATI has strengthened its capability to promote private initiative but has not applied this capability fully in all its projects.

ATI's efforts directed toward private enterprise include working directly with small-scale enterprises in developing countries and with organizations supporting small-scale enterprises. Several aspects of its approach were key in ATI's efforts to assist small-scale enterprises. ATI's support in commercial analysis helped the small-scale enterprises and implementing organizations in many of its projects to apply private sector standards of commercial viability in assessing productive activities. During the field visits, for example, the team noted that ATI staff vigorously assisted project enterprises, both technically and financially.

In Asia, ATI has developed innovative ways to help implementing organizations to involve the poor in private sector commercial activities. For example, in its venture capital operations in the Philippines and Thailand, ATI's project implementing organizations formed joint venture companies with small- and medium-scale entrepreneurs. Under the agreements made, the implementing organizations' shares in these companies will be gradually sold to workers in the ventures. Other distinctive features of ATI's approach include the following:

-- Assisting in market development. In Kenya, the private enterprise that is the principal subcontractor to the cookstoves project is also actively engaged in market development for the village-based cookstove assemblers. The contractor identifies established shops, initiates sales with quality products from his own workshop, then transfers the source of supply to the local assembler, who is trained in cookstove assembly in the contractor's workshop.

-- Promoting partnerships between large-scale community and economic development organizations and the local business community.

-- Moving private voluntary organizations toward for-profit operations (e.g., through creation of subsidiaries) and toward greater appreciation of private initiative approaches in development.

-- Providing for local manufacture of production machinery to be used in a project's core technologies, thus promoting local self-reliance and guaranteeing the machinery manufacturer (typically a small-scale enterprise) an initial market and the processing enterprises easier access to parts and service (e.g., the oil press, brick press, and dehuller technologies are locally manufactured to supply other small-scale enterprises).

Finally, ATI worked directly with private enterprises in its programs in ways that are difficult to do through AID projects. The funding mechanism in ATI's approach is a general grant to a nongovernmental organization, which acts as the implementing organization (see Appendix A). One common arrangement is for the implementing organization to establish a subcontract, loan, or revolving equity fund with a private company to carry out the productive activity or to assist other enterprises in the venture. Technical assistance from ATI sometimes goes directly to the private enterprise. ATI's program in East Africa was noteworthy for this feature (see Appendix F).

Nonetheless, ATI should more broadly apply its capability to promote private initiative. The AID Bureau for Private Enterprise, in a memorandum to the evaluation team leader responding to a draft of this report (August 7, 1986), cites the need for ATI to "develop a program for promotion of private enterprise and ensure that it is appropriately injected in all of its activities" (Dodson 1986). It also encourages ATI, under broader AID oversight, to take a lead in influencing macro policies and fostering systemic change.

2.13 AID Oversight and Accountability Requirements

The Cooperative Agreement has served to redirect ATI priorities, but some aspects of the AID system and oversight imposed by the Cooperative Agreement impede the achievement of ATI objectives.

ATI changed its operations significantly to conform to Cooperative Agreement requirements and priorities. Ironically, along with the beneficial redirection of ATI activities came numerous legal and procedural elements required by the Cooperative Agreement that reduced ATI's capacity to achieve the nonquantitative performance targets specified by the Agreement (see Section 2.1).

Bureau for Science and Technology oversight of ATI under the Cooperative Agreement was exerted formally via budgetary allocations and the requirement for Bureau approval of annual workplans. Although one might expect oversight activities to be infrequent and at a high level, in fact, the process has been bogged down by details, delays, and time-consuming negotiations. Negotiation started over the Cooperative Agreement and continued on annual workplans, long-term and replication strategies, and other issues -- most recently the budget. For example, the addition of a new priority technical field -- equipment and support for small farms -- required 18 months of negotiation between the Bureau for Science and Technology and ATI and the preparation of seven drafts of the priority technical field document (see Appendix I).

The requirement in the Cooperative Agreement that ATI

operate much more within AID's financial and accountability system also conflicted with the attainment of ATI's objectives, a problem that apparently was worsened by ATI's rigid approach to interpreting the requirements.{7} Under the Cooperative Agreement, for example, ATI was required to use AID standard contracting provisions. Apart from their effect on ATI's efforts not to be viewed as an agent of AID programming in developing countries, these provisions sharply decreased ATI's flexibility in dealing with implementing organizations (e.g., in working with soft technologies such as new financial arrangements or in covering parts of implementing organization overhead costs). ATI no longer includes implementing organization overhead costs in its grants because Provision 8 of the standard provisions requires the implementing organization to formally negotiate an overhead rate. According to ATI, this would be a slow and cumbersome process. ATI could not obtain a waiver for Provision 8 and thus made the deliberate decision to focus on commercialization of appropriate technologies rather than institutional development. Another aspect of AID's system that impeded ATI operations was the delay in obtaining waivers for vehicles. Each waiver reportedly required nine AID signatures and a great deal of Bureau for Science and Technology and ATI staff time. Other aspects of the standard provisions have led potential implementing organizations in the Philippines and Sri Lanka to reject specific ATI grants, according to ATI.

In addition, ATI has had to devote major portions of senior staff time to the support of U.S. Government inquiries into its performance. The April 1983 AID Inspector General's audit, for example, required an estimated 1,600 person-hours of ATI staff time. ATI estimates its staff had spent over 3,000 person-hours on this mid-term evaluation as of March 1986.

{7}ATI's caution should be understood in light of the various inquiries and audits of its operations (see Appendixes H and I).

2.14 Declining Core Financial Support

ATI's core financial support from AID has declined, and ATI has not been successful in diversifying its sources of funding.

The amount of annual core financial support ATI receives from AID has declined since the initiation of the Cooperative Agreement. Given AID's increasingly limited resources, many expect this declining trend to continue (see Figure 2). ATI is approaching a critical organizational size where further staff cuts would jeopardize its viability (see Appendix C).

The 1982 AID evaluation stressed that ATI should find other sources of funding and should seek financial arrangements directly with USAID Missions. The Cooperative Agreement also

encourages ATI to seek other income sources to meet its budget.

To date, however, ATI has been successful in developing only one alternative funding source, a subcontract on the Bureau for Science and Technology-funded Assistance to Resource Institutions for Enterprise Support (ARIES) project. Thus, despite a clear pattern of declining budget support from the Bureau for Science and Technology, ATI has not been able to diversify its sources of funding.

Direct use of ATI's services by USAID Missions has, in at least one instance, been inhibited by competitive bidding requirements. Progress on an "ordering agreement" to facilitate this funding mechanism has been slow,{8} due to internal AID procedures. Other efforts by ATI to get funding, such as grants from foundations or from transnational corporations that are unable to repatriate funds from developing countries, have not yet been successful. ATI cites its association with AID as an inhibiting factor in gaining U.S. private sector corporation and foundation support. These entities reportedly view ATI as a Government-supported organization, not as an autonomous agency.

{8} According to the Bureau for Science and Technology, this was to have been signed by September 30, 1986, but had not as of December 1986.

2.15 Relationship With USAID Missions

ATI and USAID Missions have complementary interests and contrasting efforts; they could learn more from each other, but communications must first be improved.

AID and ATI have complementary projects (e.g., in the Dominican Republic, Kenya, and Tanzania) in which ATI core technologies complement technological changes supported by larger AID programs. They have also funded investments that contrast with USAID approaches, based on different scales or alternative processing technologies (e.g., rhizobium inoculants in Thailand and coconut processing in the Philippines). Occasionally ATI and AID Missions have provided complementary soft-technology support and financial support to an organization (in Indonesia, Botswana, Tanzania), but typically the communication between them has been ad hoc and limited. Improved communication should lead to greater mutual awareness of common interests in many countries. All involved, including Science and Technology Bureau staff, must work on improving the communication and collaboration between ATI and AID in the field.

2.16 The Replication Approach Pushes Hard Technologies

ATI's concentrated attention to the replication of hard technologies has diminished other important

aspects of its mission, particularly innovative soft technology development and transfer.

ATI and AID are rightly concerned that there should be widespread benefits from ATI's appropriate technology efforts. It was recognized during the negotiations for the Cooperative Agreement that ATI needed to leverage its limited resources, acting as a catalyst to the technology transfer process by helping others to take up appropriate technologies for the benefit of the poor. ATI's mission calls for experimenting with alternative delivery strategies and disseminating widely the results of successful approaches. This experimentation relies heavily on the selection of the best organizational vehicles to respond to market demands.

In response to recommendations contained in a report by the Inspector General (AID March 1985), ATI and AID amended the Cooperative Agreement in 1985 to emphasize replication of the innovative elements of successful demonstration projects and to hold ATI accountable for successful replication. ATI developed a replication strategy setting out its plans, which now awaits AID's approval. In the practical application of its strategy, ATI intends to "push" hard technologies once they are shown to be commercially viable. This supply-oriented strategy diverts ATI's focus from identifying and meeting the needs of the rural and semiurban poor through the demonstration of successful technology delivery strategies. The risk with this new approach is its overemphasis on hardware elements (e.g., maize mills or cookstoves) to the neglect of the innovative soft technologies necessary for successful adoption and sustained utilization of the technologies in new settings.

ATI's long-term strategy calls for a replication phase from January 1986 to December 1988, following the initial consolidation phase. This timing is premature because it is simply too early to determine whether ATI's demonstrations are successful. Furthermore, ATI's comparative advantage does not lie in acting as an appropriate technology hardware salesman, but in supporting experimental and innovative approaches that demonstrate commercially viable and economically sustainable productive activities.

ATI, and AID in its oversight role, should ensure that ATI's organization and priorities reflect its mandate to develop, test, and adapt appropriate methodologies, and that lessons of both its successes and failures are shared with the development community. Neither should be overly concerned about a scorecard of widespread technology adoption success stories.

3. RECOMMENDATIONS

3.1 Technical and Commercial Appraisals

ATI should improve its technical and commercial appraisals

in project planning and implementation.

-- Improve and consistently apply clear criteria in selecting specific hard technologies.

-- Assess independently each core technology's state of development when necessary to assess the risks and potential payoff.

-- Generally structure project implementation to provide more intermediate go/no go decisions.

-- Continue to work toward applying more consistent commercial analysis across all projects.

-- Assess potential markets (for both input supply and product demand) more systematically and earlier in the project cycle.

-- Develop strategies for marketing the products of the funded productive activity, and for marketing the process technology to other small-scale enterprises.

-- Consistently use conventional risk assessment and risk neutralization approaches that are relevant to small-scale enterprises.

ATI should place a high priority on the further development, adaptation, and transfer of soft technologies, such as market and risk analyses, in its projects.

-- Identify needs, then develop, field test, and evaluate appropriate soft technologies suitable for small-scale enterprise development.

-- Call on other sources of expertise in the development assistance community for guidance and collaboration.

-- Develop and expand the two-way transfer of soft technologies with cooperating organizations and between projects, as was done in the Asia venture capital projects.

3.3 Field Operations

ATI should improve the management of field operations.

-- Prepare more explicit guidelines for individual project officers.

-- Improve implementation monitoring (e.g., by using

centralized project files and devising simplified reporting systems) and focus it on the major indicators of each project plan.

-- Continue to allow flexible and responsive approaches by project officers, but within a management system based on more fully understood and internalized organizational goals -- one that includes better tracking of problems, successes, and decisions in order to share learning.

3.4 Monitoring and Evaluation

ATI should improve its monitoring and evaluation of demonstration projects.

-- Revise the Project Monitoring and Evaluation System to facilitate extracting lessons learned.

-- Integrate project appraisals and staged implementation checkpoints with the Project Monitoring and Evaluation System.

-- Anticipate and plan for evaluating project impact on the poor, discussing with AID the implications of baseline data collection problems.

3.5 Replication and Dissemination of Lessons Learned

ATI should strengthen its replication plans and efforts to disseminate lessons learned.

-- Examine closely the innovative aspects of its approaches and modify them to reflect a dual emphasis on successful demonstration of appropriate technologies and widespread dissemination of the lessons learned.

-- Maintain a better balance between delivery strategies and hard technologies, in particular by not overemphasizing appropriate technology (hardware) success stories apart from appropriate delivery strategies.

-- Ensure that the commercial viability and economic sustainability of projects has been demonstrated before attempting to replicate them, and place less emphasis on quantitative replication targets.

-- Ensure that projects document the lessons learned from both successes and failures, and take steps to apply these lessons (e.g., through periodic review of field officers' functions, sharing with other assistance agencies).

3.6 Impact on Intended Beneficiaries

ATI should maximize the impact of its activities on its targeted beneficiaries.

-- Continue to ensure that a portion of its portfolio is directed toward technologies that directly involve low-income people.

-- Actively pursue technologies that depend on simple interventions to improve the existing productive activities of rural people (e.g., the wool spinning technologies in Nepal).

3.7 Cost-Effectiveness

ATI needs to consider mid-course adjustments and improvements, as well as other recommendations mentioned in this report, that will enable it to be more cost-effective.

-- Temporarily shift staff resources from new project commitments to consolidation efforts (e.g., improving ATI's own "delivery systems" in order to develop lessons learned).

-- Temporarily lift the requirement that 50 percent of AID funds go to developing country projects, to allow for improving headquarters operations.{9}

-- Articulate, refine, and share measurable effectiveness criteria that will clarify for all concerned (implementing organizations, AID, and external evaluators) the results ATI seeks to achieve.{10}

{9}The Cooperative Agreement requires that 50 percent of AID funds be committed to projects in developing countries, which places constant pressure on ATI to identify, develop, and implement new projects. The Bureau for Science and Technology has relaxed this requirement temporarily for 1986.

{10}As a counterexample, the Cooperative Agreement specifies that ATI should act as a "catalyst" to the appropriate technology process.

3.8 Bureau for Science and Technology Oversight of ATI

The oversight role of the AID Bureau for Science and Technology in assisting ATI to successfully focus its program and significantly improve its project approach can now move to a more

detached phase. The Bureau should limit its oversight to the following:

-- Monitor ATI's progress in demonstration and replication efforts and limit reporting requirements to summaries of the information that ATI requires from its implementing organizations.

-- Ensure that all impediments to the use of ATI's services by other AID units are quickly overcome, (e.g., move quickly to establish a work order agreement through which USAID Missions can use ATI's services).

-- Promote ATI's capabilities within the Agency, especially in USAID Missions, stressing broader contacts at the project officer level on issues of mutual concern and areas of complementary action.{11}

-- Promote discussions of alternative delivery strategies with ATI and other economic assistance agencies.

-- Work with ATI to identify and document lessons of relevance to AID, and monitor their dissemination and application both within ATI and externally.

-- Keep ATI informed about policy developments and related activities of AID's central bureaus and Missions and opportunities for collaboration.

{11}A separate memorandum to the Bureau for Science and Technology Technical Manager sketches ways to systematically broaden contacts (Delp 1986).

3.9 Funding for ATI Activities

AID should provide a stable level of core financial support for ATI during the remainder of the Cooperative Agreement to enable ATI to diversify its sources of funding and sustain the progress it has made under the Cooperative Agreement.{12} ATI's efforts to diversify its sources of funding should include the following:

-- Continue to work with AID to expand the marketing of ATI services that was begun in January 1986 in such activities as the ARIES project.

-- Develop a plan for diversifying funding sources that specifically treats the declining Bureau for Science and Technology core funding support for ATI, and consider alternative sources of core support both within and outside of AID.

{12}The Cooperative Agreement is to be extended for 2 more years to 1988.

APPENDIX A

WHAT IS ATI'S MISSION AND OPERATIONAL APPROACH?

1. ATI's mission is to demonstrate and facilitate use of development strategies.

2. ATI emphasizes commercially viable appropriate technologies.

3. ATI's implicit operational approach relies on developing country organizations.

4. ATI addresses the problems of small-scale producers in rural and periurban areas.

ATI'S MISSION AND OPERATIONAL APPROACH

1. ATI'S MISSION

Appropriate Technology International (ATI) is a private, not-for-profit development assistance organization established by mandate of the U.S. Congress in 1977. ATI was funded initially with a $20 million grant from the Agency for International Development (AID) and since October 1983 through a Cooperative Agreement with the AID Bureau for Science and Technology.

ATI's mission is

> to implement programs that demonstrate the utility and cost-effectiveness of development strategies directed towards rural and semi-urban areas, which disseminate commercially viable and economically sustainable technologies adapted to the resource endowment of the rural and semi-urban poor, and to facilitate use of these development strategies by other organizations on a wider scale (ATI 1986, 1).

ATI has headquarters in Washington, D.C. and field operations in Africa, Asia, and Latin America and the Caribbean. These field operations are intended to demonstrate the commercial viability and economic sustainability of appropriate technologies through projects with cooperating organizations based in each country. These are typically economic development-oriented private voluntary organizations (PVOs) focusing on the rural poor and small-scale enterprise assistance.

ATI focuses on small-scale enterprise development as a central means to achieving its mission. Rural-based small-scale enterprises manifest the problems and needs of the rural poor: deficiencies in capital, technical, and managerial skills, and the need for productive changes in process or materials used in production. ATI's mission goes beyond simply providing capital. It seeks to "act as a catalyst in the appropriate technology process, providing limited amounts of resources flexibly and rapidly to carry out innovative activities which, although inherently risky, have a high pay-off potential" (ATI 1986, 1; emphasis added).

2. EMPHASIS ON COMMERCIALLY VIABLE APPROPRIATE TECHNOLOGIES

The "appropriate technology process" involves the demonstration of the productive uses of promising technologies generated by a variety of sources (e.g., the laboratories of research and development institutes). Technology, by definition, is technical knowledge applied for useful purposes. Particular technologies take the form of either "hard" product or production processes or "soft" technologies such as operating management procedures and skills, repair and maintenance skills, marketing techniques and approaches. ATI promotes an integrated approach to both hard and soft technology development transfer.

ATI emphasizes that "appropriate technologies" are those that are "properly scaled to the intended application, that can be operated, maintained, and repaired locally, and that are designed to take advantage of available resources" (ATI 1986, 2). ATI specifically emphasizes, in a brochure describing its program, that a technology is not appropriate if its application to a productive use is not "commercially viable and economically sustainable" (ATI 1985; emphasis added).

Each ATI project has a core (hard) technology (a product or production process) that is adapted to a specific setting. These technologies are in one of three priority technical fields as required by the Cooperative Agreement: agriculture processing and waste utilization, local mineral resources utilization, and equipment and support for small farms. The following are some examples of core technologies:

-- Simple, inexpensive, low-moisture brick-making

-- Innovative edible oil extraction

-- Small-scale industrial lime production

-- Intermediate swine feed production

-- Hydro-powered grain milling

-- Innovative biotechnologies such as rhizobium inoculant (natural fertilizer) and protein-enriched cassava

-- Animal-driven water pump

-- Low-cost, durable wheelchair suitable for small workshop manufacture

The last example is being promoted by ATI as a "truly unusual development opportunity," a category that permits ATI to experiment outside the three priority technical fields.

3. OPERATIONAL APPROACH RELIANCE ON DEVELOPING COUNTRY ORGANIZATIONS

In order for ATI to "act as a catalyst" it must meet the challenge of moving technologies from source to marketplace, leading to successful utilization and diffusion of the technology. Its implicit operational approach relies on developing country organizations and private enterprises to develop and transfer technologies to rural and periurban areas, as shown in Figure A-1.

ATI establishes close formal and informal relationships with cooperating organizations in developing countries to identify local needs and opportunities and to carry out demonstration projects. Through a grant to an implementing organization, the project often finances (by loan or equity participation) one or more productive activities that manu- facture, distribute, or use the core technology. Other organizations may cooperate in the project as intermediaries in the technology development, adaptation, and diffusion process. Each ATI project under the Cooperative Agreement involves both a core (hard) technology and soft technologies (e.g., management procedures, repair and maintainance skills, financing procedures, or marketing techniques). The productive activities in a project employ the core technology, integrated with relevant soft technologies, in an income-producing activity.

For example, a ceramic-lined cookstove was successfully developed for Kenya by adapting the Thai bucket stove design to the traditional metal-clad, charcoal-burning stove used in Kenya. ATI funds the Kenya Energy Nongovernment Organizations (KENGO) group to implement a project aimed at dispersing small-scale production of the stoves throughout Kenya. KENGO is a nongovernmental organization working with other organizations to promote renewable energy technologies. Following the ATI project plan, the implementing organization contracted with a local small-scale enterprise (the intermediary) to make and distribute samples and to select and train potters to make the clay lining (the productive activity). The intermediary also contracted with entrepreneurs in rural market places (also

productive activities) to assemble and sell the stoves. Both the implementing organization and the intermediary share responsibility for cookstove quality.

INSERT FIGURE A-1

ATI's program aims to promote widespread dissemination of successful delivery strategies derived from their experience with the demonstration projects. ATI's replication strategy was proposed in 1985 in response to a recommendation in a report by the AID Inspector General which called for accountability for replication. The Bureau for Science and Technology then requested a replication strategy addendum to the annual workplan. According to this strategy, an innovative element is a new or changed application or adaptation of an appropriate technology in an ATI demonstration project. The innovation may be a product, production process, or dissemination mechanism and procedure. Replication occurs when the dissemination or diffusion of innovative elements occurs "beyond the objectives and implementation plan of the original [successful demonstration] project." ATI may play an active role in this process, acting as the replicating agent, or it may mobilize other organizations for this purpose.

ATI's original charter directed it to be innovative and experimental, and thus its operational approach to selecting implementing organizations and identifying core technologies should include high-risk ventures. ATI's mix of hard and soft technologies and institutional collaboration is experimental. Since ATI is supposed to undertake risky ventures with high potential payoffs, it is not expected that each demonstration project will prove to be commercially viable and economically sustainable.

4. ADDRESSING THE PROBLEMS OF SMALL-SCALE PRODUCERS IN RURAL AND PERIURBAN AREAS

AID's proposal for a program in appropriate technology stressed that the new organization should be needs oriented rather than technology driven. Working under the Cooperative Agreement, ATI has emphasized the identification of the real needs of people in their local environment. ATI's projects provide opportunities for the rural and semiurban poor to benefit from the use of appropriate technologies and share in the benefits of technological change (e.g., through incomegenerating development activities and direct employment and through improved access to technological goods that can improve their lives).

In the 1986 Annual Workplan (P.2), ATI focuses on five key problems among the "whole panoply of issues faced by the poor:

-- "The growing number of rural and semiurban under and unemployed...."

-- "Lack of opportunity for productive activities in rural areas...."

-- "Poor performance of technologies used in development programs...."

-- "Lack of enterprise experience...."

-- "Economic policies detrimental to growth of small industries...."

ATI addresses these problems through the appropriate technology process by focusing on productive enterprises appropriate to small-scale producers in rural areas and in the perimeters of urban areas. The operations and achievements of ATI mesh with two key aspects of U.S. economic assistance programs: technology development and transfer, and small-scale enterprise development and promotion.

APPENDIX B

HOW TO EVALUATE A CHANGING ATI

1. ATI has been in a continuous process of change.

2. The mid-term evaluation

   2.1 The scope of work for the evaluation covered ATI's performance and broader significance. Replication progress was to be addressed.

   2.2 The planning and implementation of the mid-term evaluation.

3. The primary emphasis of this evaluation.

EVALUATING A CHANGING ATI

1. ATI's CONTINUOUS PROCESS OF CHANGE

The difficulty of evaluating ATI's performance is compounded by the continuous process of change it has undergone. These changes started while the Cooperative Agreement was being negotiated in 1982. Significant staff reduction and turnover have occurred. A 1984-1985 audit of ATI by the AID Inspector General triggered other changes that greatly emphasize accountability for replication. This present evaluation of ATI was planned for the mid-term of its Cooperative Agreement with AID, but delayed until November 1985 in part to allow ATI time to develop a replication strategy. In drawing conclusions from its findings

and analysis, the evaluation team has attempted to weigh the changing circumstances affecting ATI's performance.

2. THE MID-TERM EVALUATION

2.1 The Scope of Work

The scope of work for the evaluation covered ATI's performance and broader significance. Replication progress was to be addressed. Three distinct areas of inquiry were specified:

-- ATI's performance under the Cooperative Agreement

-- Lessons of broader significance for the technology transfer process and the promotion of small- and medium-scale enterprises

-- Assessment of ATI's capability to implement a strategy for replicating the innovative elements of its successful appropriate technology demonstration projects

The Cooperative Agreement (as amended) also specified certain requirements for the mid-term evaluation of ATI's performance:

> Particular attention will be given to [ATI's] success in focusing its activities, the effectiveness of its demonstration projects in proving the commercial viability and economic sustainability of particular technologies, and its progress in carrying out the Replication Strategy Addendum. The role of the cooperative relationship between ATI and AID in furthering the purpose of this [Cooperative Agreement] will also be considered. (Cooperative Agreement, as amended; No. 1)

A particular concern of the Bureau for Science and Technology, Office of Rural and Institutional Development (S&T/RD) is whether ATI has achieved the proper balance in its programming between institutional development and promotion of hard technologies.

The scope of work specifies that the evaluation team examine "lessons of broader significance for the technology transfer process and the promotion of small- and medium-scale enterprises." The Center for Development Information and Evaluation (CDIE) of the Bureau for Program and Policy Coordination (PPC) of AID is particularly interested in how ATI fits into the larger sphere of donor assistance aimed at technology transfer and small-scale enterprise assistance.

The treatment by ATI and S&T/RD of the "replication of the innovative elements of ATI's successful appropriate technology demonstration subprojects" was the major theme of an AID

Inspector General's l985 report. As indicated in the scope of work for this evaluation, it is still too early to evaluate replication results. Therefore, the evaluation focused on ATI's capability to implement the replication strategy now awaiting approval from AID.

2.2 The Planning and Implementation of the Mid-Term Evaluation

The mid-term evaluation was designed jointly between the S&T/RD Technical Manager and the Technology Transfer Evaluation Series Coordinator of CDIE, with the consultation of ATI. A team was drawn together and cleared by senior management in both bureaus.

The evaluation team developed a core framework for the field evaluation component, which focused primarily on (1) the productive activities, (2) the implementing organizations for the ATI projects, and (3) ATI's links to these entities and other organizations, including the USAID Missions in the countries visited. Experts in small-scale enterprise technical assistance and evaluation and in appropriate technology were brought in to consult with the team in a workshop prior to the fieldwork. The consensus was that profitability was the bottom line in appraising productive activities, as was the commitment of resources and capabilities of the staff for the implementing organizations. The core framework was built on these concerns.

The evaluation team comprised three senior AID staff and four consultants from DEVRES. The team separated to evaluate the ATI field operations in three regions, using a standard package of project documents supplied by ATI and the common evaluation framework. In an effort to control for individual biases in the separate regional evaluations, all team members participated in pre- and post-fieldwork briefings and reviews of findings. A simulated interview session on a selected ATI project was carried out at ATI Headquarters in the preparatory workshop, and the team's performance was evaluated by the outside experts. The core framework was modified as a result.

Ten projects were delineated for detailed evaluations at mid-term, according to the plan sketched in the Cooperative Agreement. Baseline data collection was to have been started for each of the selected projects to enable the evaluation team to assess the likely impacts of the projects on the poor.

The itineraries of the regional evaluation field trips were arranged so that each regional team could visit the projects for 1-3 days, accompanied by ATI staff. However the statement of work for the evaluation did not restrict the inquiry to only those designated projects, and each team visited other ATI projects in its region.

Nearly all the projects were at an early stage with respect to the productive activities. Baseline data were not available

for most of the projects, except for a few studies (e.g., the socioeconomic survey of the lime kiln operators in Costa Rica), and, in most cases, some difficulties had been encountered in arranging for timely and consistent data collection.

Because it was too early in the establishment of productive activities in nearly all projects visited to attempt to measure benefits, the evaluation team could not assess the impact of each project visited according to its intended targets and participation opportunities. Furthermore, ATI's Project Monitoring and Evaluation System ties data collection to the start of productive activities. There were no other ATI or project information systems functioning to supply the data necessary to assess project impact. (See Appendix G for further discussion of baseline data.)

As a consequence, the evaluation team members looked more broadly at the ATI project activities in the countries visited, not just the 10 designated projects. ATI prepared extensive briefing materials on the projects, including memos on implementation status, monitoring and evaluation issues, and quarterly progress and financial reports.

Altogether the three field teams visited 20 productive activities in 18 projects{1} in 10 countries and interviewed people in London and Oakland, California as well. At least one ATI staff member joined each team in each country. Upon return, a series of meetings was held in Washington, D.C. with ATI to clarify ATI's project cycle, management, planning, appraisal, and monitoring and evaluation activities.

Throughout the evaluation process, both ATI and S&T/RD were fully cooperative. In addition to the briefing documents, ATI provided extensive comments that were useful in revising the draft regional reports. The team also benefited from consultation by four participants in the 1982 AID evaluation of ATI and useful comments by the leader of that evaluation on draft reports.

The evaluation team leader and partner on the African field visits met with the Senior Economist for the Intermediate Technology Development Group{2} in London. The discussion was useful in developing the team's understanding of the evolution of the appropriate technology movement and the Group's perceptions of the changes at ATI under the Cooperative Agreement.

{1} Each of the 18 projects had at least one productive activity associated with it. Rural small industries development in the Philippines and the wheelchair projects in the Latin America and Caribbean region had two (see Table F-1, Appendix F). Several "productive activities" were only in the testing stage.

{2} The Intermediate Technology Development Group was founded by E. F. Schumacher, author of Small is Beautiful.

3. THE PRIMARY EMPHASIS OF THIS EVALUATION

The mid-term evaluation of an AID project ought to provide a straightforward assessment of progress and problems to date, with comments on outstanding performance in pursuit of objectives and recommendations on how to solve problems. This evaluation, near the mid-term of ATI's Cooperative Agreement with AID,{3} tried to achieve that purpose, but in a way that would lead to lessons of broader significance to AID and the donor community. If ATI is to achieve its intended role as experimenter in innovative appropriate technology delivery strategies with a potential for widespread benefits for the rural poor, then its field operations are the starting point for a series of questions. For example,

-- Is the productive activity that is demonstrating the core (hard) technology commercially viable, or is it too early to tell?

-- If it is too early, (which was the case for nearly all of ATI's projects at that point in the Cooperative Agreement), has ATI adequately assessed the prospects for profitability, economic sustainability, and replicability?

-- In view of the uncertainties inherent in risky ventures, are ATI and its cooperating organizations capable of making these assessments and disseminating the results?

-- Finally, in light of the commitment of AID and other donors to helping the rural poor develop small-scale enterprises and to promoting appropriate technology development and transfer, will ATI be able to influence the donor community with the lessons extracted from its experience?

The evaluation started with this framework of issues and ended with attempts to characterize where ATI fits into the larger context of development assistance.

{3} Because of the activities by S&T and ATI in responding to the Inspector General report on accountability for replication, the evaluation was delayed to the end of 1985. This is roughly the midpoint of the Cooperative Agreement as extended to 1988.

APPENDIX C

HOW HAS ATI BEEN ORGANIZED AND FINANCED TO CARRY OUT ITS MISSION?

1. ATI organizational structure and staffing

1.1 ATI began changing its organizational structure and staff prior to the Cooperative Agreement.

1.2 ATI's organization under the Cooperative Agreement was a matrix structure and a committee arrangement.

1.3 The Department of Field Operations mobilizes regional teams.

2. ATI has significantly improved its project planning and approval process under the Cooperative Agreement.

3. ATI's general program support activities

3.1 ATI's policy efforts are now geared toward support of its demonstration activities and upcoming replication projects and efforts.

3.2 Resources devoted to ATI's information dissemination activities have been sharply reduced.

3.3 ATI's planning and operating strategies must be developed through a participatory process in which satisfaction of priority needs in the field is balanced with availability of human and physical resources.

4. Funding for ATI's mission

4.1 ATI's financial support from the Bureau for Science and Technology has declined yearly, but ATI was able to maintain about the same level of field operations and expenditures under the Cooperative Agreement through 1985.

4.2 ATI's allocation of resources through December 1985 had been in conformance with the Cooperative Agreement targets.

ATI'S ORGANIZATION

1. ATI ORGANIZATIONAL STRUCTURE AND STAFFING

1.1 Changes in Organizational Structure and Staff Prior to the Cooperative Agreement

In l977 ATI was incorporated as a private not-for profit corporation in the District of Columbia. It operates under the direction of a Board of Trustees which establishes policy and operational guidelines, approves annual budgets and workplans, and generally oversees ATI's program. During the grant period prior to October 1983, ATI underwent several organizational changes that resulted in a structure of relatively autonomous

departments, with a staff of 64, all based in Washington, D.C. Department managers hired staff, set salary rates, and organized their operations without much interference from senior management. The organizational climate was such that individual initiative was rewarded. The loose administrative style was in keeping with the experimental roots of the organization. However, it also fostered a climate of intense competition and jealousy within the organization.

In l982 ATI's Board of Trustees replaced the Executive Director and mandated a number of changes to the structure of the organization:

-- Elimination of program areas outside of field operations (Business and Technology Services, and Policy and Communication Services)

-- Elimination of a significant number of staff positions.{1}

As a consequence, the structure of field operations was standardized, activities in the Middle East and Pacific Ocean countries were dropped, and job descriptions and salaries were rationalized. Other departments were eliminated, and the three regional programs remaining thus became a much larger part of ATI's scaled-down operations. Staff in the Latin American and Caribbean region, which reportedly once numbered 13 and in l982 still numbered 9 people, was reduced to 4 people: a regional manager, two project officers ("operations staff"), and an administrative officer. This pattern was repeated in each region.

ATI was confronted with a problem as it began its field operations under the Cooperative Agreement: What to do with the projects initiated under the grant which were still active? The Director of Field Operations took a "no nonsense" approach, cutting off funding for nonperforming projects without causing ATI to renege on any contract obligations. Funding and support were continued for grant projects that were performing satisfactorily. ATI sought to minimize the time and effort in cleaning up the portfolio of grant projects. Nonetheless, there was a considerable drain on regional program staff time to deal with holdover projects, pursue financial and reporting requirements, and clear up old grant projects. By attrition of old projects, this situation improves each year, and no grant-funded project should be on the books after September 30, l986.

{1} The best available estimate of the reduction of staff was from a maximum of 64 in December 1981 to 42 positions in 1983.

1.2 ATI Organization Under the Cooperative Agreement

ATI's organization under the Cooperative Agreement was a matrix structure with a committee arrangement (see Figure C-1).

Authorized staff positions in December l985 were 45.{2} The ATI organizational units were as follows:

-- Office of the Executive Director
-- Department of Field Operations
-- Department of Finance and Administration

The structure and functions are briefly described in the ATI 1986 Annual Report (pp. 14-16).

ATI's overall management and field operations project management was based on a committee arrangement, as described in the l986 Annual Workplan (p. 15). These committees, all composed of ATI management and staff, functioned as follows:

-- Management Committee: Consisting of the Executive Director, Director of Field Operations, Director of Finance and Administration, Director of Planning and Policy, and Manager of the Evaluation and Technical Development Group; responsible for overall management of the organization, under direction of the Executive Director.

-- Concept Review Committee: Reviews and approves or rejects project concepts prepared by ATI staff. Approval indicates project development may begin.

Insert Figure C-1

-- Project Administration Committee: Reviews project status, solves administrative problems, and coordinates interprogram and departmental communication.

-- Replication Committee: Reviews projects for their replication potential, coordinates interprogram and departmental replication, reviews reports and develops supporting documentation on replication, and initiates action in furtherance of ATI's replication strategy.

In addition, ATI had created an advisory committee, composed of a multidiciplinary group of development, scientific, and technical professionals from outside ATI, as part of its project approval process.

-- Project Review and Advisory Committee: Provides critical advice to the Executive Director and project officers regarding project design and technologies proposed.

{2} In August 1985, ATI reduced its management staff significantly, eliminating one layer of authority. These changes were not evaluated.

1.3 The Department of Field Operations

Figure C-1 depicts the line and staff organization of ATI's field operations, which resembles a matrix organizational structure. The line programs were under regional managers for Africa, Asia, and Latin America and the Caribbean. Each region had positions for three project officers (not all staffed as of February l986) and an adminstrative officer. These programs were each allocated roughly one-third of the project development budget, adjusted according to project concepts and plans in the pipeline, staff constraints (turnover and hiring), and opportunities.

The staff functions are partly under the Evaluation and Technical Development Group, which reports to the Director of Field Operations. The group was formed in l985 by merging the Technology and Enterprise Development Group and the Evaluation Group. This Group provides project backstopping support across regions on technical, economic, and evaluation issues.

The Department of Finance and Administration assigns staff to handle the contract management and financial reporting requirements.

In theory, a project matrix management structure is used to mobilize teams to address field projects by drawing on line personnel (the regional manager and project officers) and staff personnel (technical, business, and evaluation specialists). ATI's planning and implementation of Cooperative Agreement projects involve the project officer and the regional manager and administrative assistant (line functions), and the relevant technical specialist and evaluation staff from Evaluation and Technical Development Group.

In practice, an organization following the matrix management structure requires careful management of individual responsibilities, usually with clear guidelines and commonly understood objectives and priorities. ATI does not have this aspect of its field structure formalized (see Appendix G).

2. CHANGES IN ATI'S PROJECT PLANNING AND APPROVAL PROCESS

ATI has significantly improved its project planning and approval process under the Cooperative Agreement. ATI estimates that over 2,000 project ideas have been considered since the Cooperative Agreement, leading to about 100 concept papers. Thirty-six of these had been brought to the project-plan stage and approved by January 1986. The screening and approval process is described in the following paragraphs.

Project concept papers are prepared by project officer teams and reviewed by the Concept Review Committee. The

document defines the problem and opportunity, the effect of the proposed technology, the innovations, the implementing organization, and the project scope, outlining the implementation strategy, expected direct and indirect effects, costs, and (as of early 1986) replication potential.

If the concept is approved, ATI invests resources in preparing a project plan. Mini-grants (under $5,000) can be let to the prospective implementing organization, or to consultants, for further work in developing the concept, testing the technology, or assessing the market. However, most development work is done by project officers and Evaluation and Technical Development Group staff.

Project plans are now much more comprehensive documents than those prepared under the Grant. The latter may have been not much more than what now is required for the concept document, and review and approval were reported to have been very informal and ad hoc steps. Project plans now address technical, economic, and financial aspects.

Plans are prepared by regional teams, assisted by the Evaluation and Technical Development Group. When a project plan has been reviewed by the regional manager, and approved by the Director of Field Operations, it is presented by the project officer to the Executive Director. At each stage the plan may be rejected or sent back for modification. The Executive Director decides whether the plan goes to the Project Review and Advisory Committee. The AID S&T Technical Manager is invited to the review in an ex-officio capacity. ATI's Board reviews and approves (or rejects) all projects over $100,000.

A project that passes all reviews can then be implemented under contract by a cooperating organization (the implementing organization) on the final decision of the Executive Director. Figure C-2, prepared by ATI, describes the project approval process.

Implementation of the projects is a shared responsibility between the Department of Field Operations and the Department of Finance and Administration. Grants and Contracts, in the Department of Finance and Administration, produces monthly project financial status reports, which track obligations, advances, disbursements, and expenditures. It also receives, reviews, and approves all project quarterly financial reports from project implementing organizations. The Department of Field Operations project officer supervises all other matters, primarily by means of three or four trips to the project sites per year. Travel by project officers is extensive, as ATI has no staff resident in the project countries.

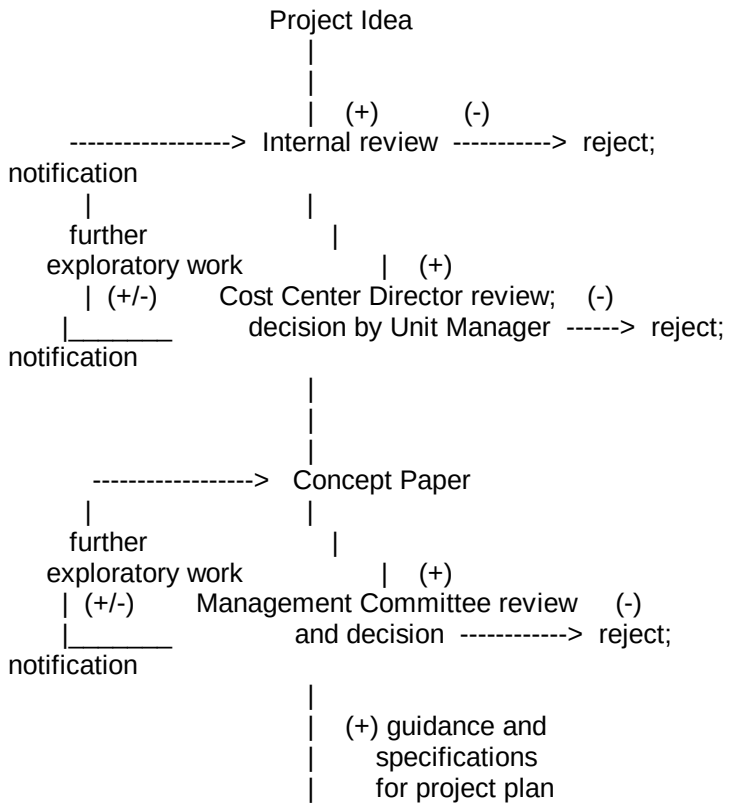
The disbursement of project funds is contingent on submission of quarterly financial reports by the implementing organizations. Consequently, project officers have to be concerned with financial as well as substantive matters if the flow of funds is not to be halted. An implementing organization's

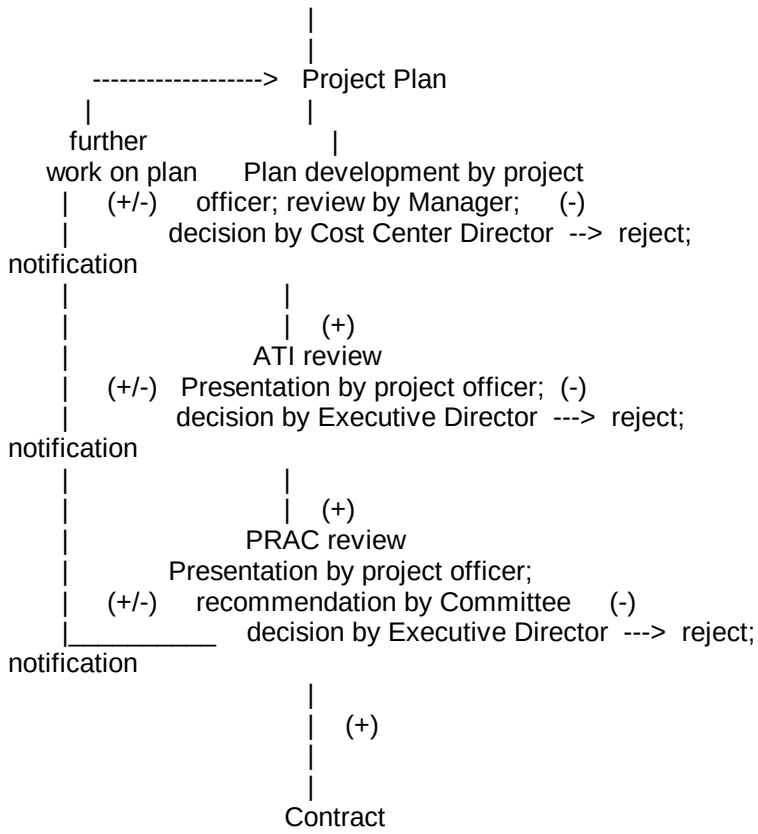
cooperation is essential, and its capability to implement development projects are critical to this process.

Project evaluation requirements, spelled out in the plan, are addressed in field visits with the implementing organization by both project officers and evaluation staff. Ten of the Cooperative Agreement projects had special evaluation requirements for gathering baseline data, and these have received more attention than other projects. ATI has instituted its Project Monitoring and Evaluation System, which is a primary responsibility of the Evaluation and Technical Development Group (see evaluation in Appendix G).

ATI is to be commended for the changes made in project planning and approval. The much more rigorous approach under the Cooperative Agreement has not damaged ATI's reputation for being able to move quickly from concept to contract. A 6- to 8-month period from project concept to implementation allows ATI to take advantage of "windows of investment opportunity" that may bypass the more cumbersome project cycles of large donor programs. Bringing in outside views through the Project Review and Advisory Committee has also been worthwhile, especially in raising issues that might otherwise have been overlooked.

Figure C-2. ATI Project Approval Process





The S&T/RD Technical Manager has indicated that perhaps more time should elapse between the Project Review and Advisory Committee meeting and the letting of a contract to allow for more collaboration between AID and ATI in effecting any indicated design modifications and implementation contingencies. AID does not approve individual projects, nor was such a direct role in the project cycle intended. The Cooperative Agreement indicates the type of projects that can be supported, and characterizes the project implementing organizations, the documentation required, and the like. It also sets guidelines for the level of government approval that is required and for financial arrangements that ATI can make with project implementing organizations. Therefore, AID has an effective veto when the project involves matters that go beyond the standard provisions for contracting, such as loan guarantees or equity participation. (These issues are discussed in Appendix I.)

3. ATI'S GENERAL PROGRAM SUPPORT ACTIVITIES

ATI's general program support falls under the office of the Executive Director. It covers some of the elements in AID's proposal to Congress for a program in appropriate technology. These include the following:

-- Participating with the international policy research and academic community in the development of policy frameworks for promoting and increasing access to appropriate technology

-- Providing developing country organizations and governments with information on program planning and policy strategies to facilitate the dissemination of project results and the application of appropriate technology

-- Facilitating the participation of U.S.-based appropriate technology groups, universities, research institutions, and private voluntary organizations in appropriate technology development programs and projects, and small- and medium-size U.S. businesses in relevant industrial fairs and exhibitions in developing countries

-- Maintaining a reference library on appropriate technologies

ATI's general program support activities have continued under the Cooperative Agreement, but at a much lower level of effort.

3.1 Focus of ATI Policy Efforts

ATI's policy efforts are now geared toward support of its demonstration activities and upcoming replication projects and efforts. Originally, ATI's involvement with developing country policy on appropriate technology was a more prominent part of its overall program. Developing country governments face critical policy issues and decisions concerning choice of technology, support of small-scale enterprise development, regulation by government of private sector activities, active promotion of technology transfer, support of rural industrialization, and related issues. Despite the importance of these issues, there is little that an interested organization can do to change government policies. ATI's influence can perhaps best be asserted by example. In other words, ATI needs successful demonstration projects to convince developing countries that appropriate intermediate production technologies can enhance the benefits to target groups, while saving foreign exchange and building up local technical capabilities.

The field of appropriate technology policy was so greatly in need of leadership that over the past 2 years ATI was able to attract such outstanding development economists as Francis Stewart, Gustav Ranis, Raphael Kaplinsky, Stephen Biggs, Paul Streeten, Howard Pack and others to study the influence of macro-policies on technology transfer to rural areas. Their studies and enthusiastic participation in a seminar in January 1986 demonstrate the continuing importance of appropriate

technology to the development community. ATI organized the seminar in collaboration with the Overseas Development Council.

Prior to the Cooperative Agreement, policy was a separate department of ATI. It has been moved under the office of the Executive Director. The main aim is to support field operations by assisting project officers to identify and overcome potential policy bottlenecks affecting ATI's demonstration projects. This process may lead to the decision not to continue working in countries where ATI cannot find effective partners. ATI's Department of Field operations closed out its operations in Malawi for this reason.

ATI's policy efforts try to "identify and appraise key policies which inhibit the widespread use of productive technology by the public and private sectors in selected developing countries" (ATI l986, 58). These efforts will support the development and implementation of the replication strategy. It is an important and difficult task, given ATI's organizational size. However, ATI can call on its network of recognized development experts. In discussions with the senior economist at the Intermediate Technology Development Group in London, the economist stated that the Group will concentrate its socioeconomic studies in only 8 countries (while continuing technical assistance on request throughout the developing world). This reflects the difficulty of the task.

3.2 ATI Information Dissemination Activities

Resources devoted to ATI's information dissemination Activities have been sharply reduced. Before the Cooperative Agreement, the information and dissemination activities of ATI were a major overhead expense, employing 12 to 15 people. In November 1985, the function was in the office of the Executive Director and staffed with a communications officer who works on quarterly progress reports and annual progress reports to AID. She also has primary responsibility for ATI's Annual Report and a variety of other publications and information functions for ATI. These AID progress reports and the Annual Report require about 6 person-months a year to complete. A part-time librarian in the office of the Executive Director is responsible for ATI's library and information resources. She acquires documents, data, and information for ATI staff and implementing organizations and responds to and directs numerous requests for information from ATI staff. The Special Assistant to the Executive Director devotes about three-quarters of her time to preparing documents and information for people outside ATI.

ATI's Field Operations and Evaluation and Technical Development Group staff produce reports and materials to support ATI's demonstration projects, including the Appropriate Technology Bulletin, technology prospectus, project technical reports, and technology appraisal reports. Under the replication strategy, they will also produce replication reports

and replication achievement reports. ATI recently completed a film on ATI demonstration projects, "Small is Powerful," which will be used to promote appropriate technology as a successful development strategy in developing countries.

ATI's mission statement calls for it to facilitate the use of these development strategies by other organizations on a wider scale. This reflects one intention that will be fulfilled when ATI has clearly demonstrated its abilities and has something to communicate. Nonetheless, ATI's attention to dissemination under the Cooperative Agreement may require a larger share of resources, especially as the replication strategy is implemented.

3.3 ATI Planning and Operating Strategies

ATI's planning and operating strategies must be developed in a participatory process in which satisfaction of priority needs in the field is balanced with availability of human and physical resources.

The planning function is the responsibility of the Director of Planning and Policy. Since joining ATI in December l984, the Director has spent most of his time in planning, not policy, and had been in close liaison with AID's S&T/RD Technical Manager.

Workplans in the first several years of the Cooperative Agreement were produced mainly by the office of the Executive Director, with a top-down approach imposed by timing and negotiating difficulties with AID. In 1985, for the first time, the preparation of the l986 Workplan was designed to be a participatory, bottom-up planning process within ATI. Regional managers and project officers were more actively involved in its preparation.

Planning for ATI is still complex and difficult because of the various contributors within and outside the organization. Because it is not yet a bottom-up effort, its Board of Trustees, with direct authority over ATI's organization, staff, program, and policy, is involved in plan formulation. For example, explorations of new areas of activity such as equity participation by ATI have to be approved in principle by the Board. AID/S&T, as the conduit for ATI's funding, exercises considerable control over ATI's undertaking of new initiatives and financing mechanisms (see Appendix I). Thus, despite ATI's emphasis on responding to feedback from its cooperating organizations in the top-down approach may leave many of the needs and opportunities identified in the field outside of the plan.

4. ATI FUNDING

4.1 Declining Financial Support

ATI draws all its financial support from the budget allocation of AID's Bureau for Science and Technology, Office of Rural and Institutional Development. Although this financial support has declined yearly, ATI was able to maintain about the same level of field operations and expenditure under the Cooperative Agreement through 1985.

Table C-1 illustrates ATI's worsening budget situation. A spending level of $18 million for the 3 years of the Cooperative Agreement was initially discussed. After negotiations among ATI, AID, and Congressional staff, the total was reduced to $16.5 million, which implies an annual spending rate of $5.5 million. From this total, AID obligated nearly $5 million just prior to the end of FY 1983. This amount plus subsequent obligations enabled ATI to maintain a more or less constant level of expenditure; however, the 1986 obligation is only 41.5 percent of the implied $5.5 million annual commitment rate, and proposed budgets for 1987 and 1988 are 34.2 and 31.8 percent, respectively (see Table C-1). Although this eroding financial support had not yet significantly affected ATI's performance under the Cooperative Agreement through November 1985, it will require significant action by ATI and AID in 1986.

4.2 ATI Allocation of Resources To Meet Cooperative Agreement Targets

As of December 1985, ATI was in conformance with the Cooperative Agreement performance targets for allocation of resources. The allocation percentages by performance target were as follows:

-- 89 percent of AID financial assistance funds committed to projects in priority technical fields. (ATI had committed 91 percent.)

-- 50 percent of AID funds committed to projects in developing countries. (ATI had spent greater than 51 percent.)

-- 75 percent of funds spent on field projects and supporting activities. (ATI had spent 84 percent.)

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Table C-1. Declining AID Funding of ATI by Calendar Year
($ thousands)

	1983-84	a Est 1985	Proj 1986	Proj 1987	1988	Total
Implied Cooperative						

Agreement Annual Commitment Rate	6875	5500	5500[b]	5500[b]	5500	28875
Pipeline at Beginning of Period	0	2851	1547	800	280	
New Obligations (FY basis)	9429[c]	3900	2280	1880	1750	19239
Commitments	6578	5204	3027	2400	2030	19239
Pipeline at End of Period	2851	1547	800	280	0	
New Obligations as Percentage of Implied Rate	137.1	70.9	41.5	34.2	31.8	66.6
Commitments as Percentage of Implied Rate	95.7	94.6	55.0	43.6	36.9	66.6
Pipeline at End of Period as Percentage of Implied Rate	51.8	28.1	14.5	5.1	.0	

aSeptember 30, 1983 to December 31, 1984.
bThe original implied Cooperative Agreement commitment rate is extended through 1987 and 1988 for illustrative purposes only.
cIncludes 4,929 obligated in FY 1983 and 4,500 obligated in FY 1984.

Source: Technical Manager, S&T/RD

However, the declining level of budget support jeopardizes the ability to maintain these percentage target allocations without major program changes. (The project obligations presented in Appendix D should be seen in this light.) The newly instituted emphasis on supporting replication of ATI's demonstration projects also required staff time and financial resources that could otherwise have been devoted to projects in developing countries (see Appendix H).

APPENDIX D

HAS ATI DEVELOPED A WELL-FOCUSED PORTFOLIO OF INNOVATIVE, RISKY FIELD PROJECTS?

1. ATI has better focused its country project portfolio.

1.1 Each ATI project emphasizes a core technology in a priority technical field.

1.2 ATI significantly reduced the number of projects funded each year, increased the average size of project grants to implementing organizations, and worked in fewer countries than before the Cooperative Agreement period.

2. Under its mandate, ATI has experimented with risky and innovative technologies in its projects.

2.1 Hard technologies in ATI's projects include a wide variety of innovations.

2.2 A variety of soft technologies, including financial and organizational innovations, support productive activities in ATI's projects.

2.3 ATI has established an appropriate mix of projects in its portfolio, some more innovative and thus inherently more risky than others.

ATI'S PORTFOLIO OF FIELD PROJECTS

1. FOCUS OF ATI'S COUNTRY PROJECT PORTFOLIO

Since the Cooperative Agreement, ATI has improved the focus of its country project portfolio. As of the end of l985, ATI had formally initiated 36 projects under the Cooperative Agreement (see Table D-1). This is a slightly higher rate of project funding than the Cooperative Agreement performance target of 45 approved projects by September 30, 1986.{1} This section analyzes all 36 projects by size of grant, regional location, and core technology.

{1}The performance target is 45 projects in 36 months; ATI's 36 Cooperative Agreement demonstration projects in 28 months extrapolates to at least 46 projects by September 30, 1986.

1.1 Project Emphasis on a Core Technology in a Priority Technical Field

Each ATI project emphasizes a core technology in a priority technical field. The core technologies of ATI projects funded in l984 and l985 fall into four categories:

-- Agricultural products processing and utilization of agricultural wastes (e.g., grain processing, edible oil recovery)

-- Local mineral resources (e.g., lime kilns, brickyards, potteries, small-scale placer mining equipment)

-- Equipment and support for small farms (e.g., animal-driven pumps, rhizobium inoculant for soybeans)

-- Truly unusual development opportunities (e.g., wheelchair manufacture)

The first three are priority technical fields approved under the Cooperative Agreement and its amendments. Most of the predominant core technologies (21) have been in the field of agricultural products processing, which has received 63 percent of the grant funds. Eight projects utilize local mineral resources technologies and have received 19 percent of grant funds. These two technical fields have not been an AID priority, and ATI activities fill a gap. The third priority field, equipment and support for small farms, includes five projects that have received less than 8.1 percent of the grant funds. However, it was not formally approved as a priority technical field for ATI until l985. ATI has promoted only two projects classified as truly unusual development opportunities, for 8.8 percent of the grant funding. These are the Latin American regional wheelchair project and the computer-video training project in Sri Lanka.

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Table D-1. Cooperative Agreement Projects (greater than $5,000)

Project Name	Priority Technical Fielda	Implementing Organization	Country	Obligation Date	Grant Amount
AFRICA REGION					
Animal-Driven Pumps	ESF	RIC/RICA	Botswana	Oct 1983	108,000
Brick Production	LMR	MHT/SRDA	Botswana	Jan 1984	90,400
Palm Oil Extraction	APP	APICA	Cameroon	Oct 1983	304,324
Units					
Agro-Industries	APP	FEP	Zimbabwe	Apr 1984	224,500
Biogas Refrigeration	APP	GRAT	Mali	Oct 1984	13,445
Oil Press Production	APP	CAMARTEC	Tanzania	Jan 1984	112,276
Rural Potteries	LMR	CAMARTEC	Tanzania	Jan 1984	97,512
Village Oil Press	APP	LWR/ELCT	Tanzania	Nov 1984	142,676
Improved Bricks	LMR	CAMARTEC	Tanzania	Nov 1984	156,452
Lime Production	LMR	MHT/SRDA	Botswana	Dec 1984	

95,000
Grapple Processing APP TL Botswana Mar 1985
37,100
Shea Nut Butter APP CEPAZE Mali Mar 1985
52,070
Ceramic-Lined CookstoveLMR KENGO Kenya May 1985
254,097
Angun Maize Mills APP APICA Cameroon Jul 1985
164,084
Hydro-Powered Grain APP SODERZA Zaire Dec 1985
282,580
Mills
Mali Dehullers APP CMDT Mali Dec 1985
132,318

ASIA REGION

Venture Capital Co. APP YDDT Indonesia Jan 1984
300,824
Rhizobium Inoculant ESF SVITA Thailand May 1984
137,700
Rural Small-ScaleIndus APP PDA Thailand Jan 1984
310,733
Protein-Enriched APP PDA Thailand Jan 1984
210,300
Cassava
Rural Small Indus. APP FFI Philippines Dec 1984
367,440
Dev.
Wool Spinning APP ACP Nepal Nov 1984
165,144
Turbine-Driven APP NEW ERA Nepal Dec 1984
29,959
Agro-Proc
Computer-Video TUO DASUNA Sri Lanka Nov 1985
240,076
Training
Organic Fertilizer ESF FFI Philippines Dec 1985
107,957
Indus. Salt & Chem. LMR FFI Philippines Dec 1985
151,791
By-Prod.
Mahaweli Rural APP MASL Sri Lanka Dec 1985
350,000
Industries

LATIN AMERICA/CARIBBEAN

Lime-Kilm Technology LMR C/ITCR Costa Rica May 1984
144,514
Cassava Processing APP SAVACAMPE Haiti Mar 1984
86,821
Swine Feed Technology APP CIMPA Dom. Rep. May 1984
160,977
Linares Pump ESF SCF Regional Nov 1984
18,200

Wheelchairs	TUO	H/SEPAS	Regional	Dec 1984 300,800
Annato Production	APP	CITTA	Peru	Jul 1985 161,691
Farm Support Enterprises	ESF	COLEGIO	Mexico	Dec 1985 221,000
Small-Scale Placer Mining Equipment	LMR	CITTA	Peru	Dec 1985 177,376
Potato-Based Products	APP	C. IDEAS	Peru	Dec 1985 312,982

aAPP = Agricultural Products Processing and Agricultural Waste Utilization.

ESF = Equipment and Support for Small Farms.
LMR = Local Mineral Resources.
TUO = Truly Unusual Opportunity.

1.2 Changes in Number and Size of Projects

ATI has significantly reduced the number of projects funded each year, increased the average size of project grants to implementing organizations, and worked in fewer countries than before the Cooperative Agreement period. Between October 1983 and December 1984, 22 projects were initiated under the Cooperative Agreement: 10 in Africa, 7 in Asia, and 5 in Latin America. In 1985, only 15 projects were initiated.2 Except in Africa, coverage of the priority fields became more balanced in each region over this 2-year period (see Figure D-1). Africa emphasized agricultural products processing projects, but had a comparatively much higher proportion of local mineral resources projects, all located in East and Southern Africa.

Similar declining trends from 1984 to 1985 occurred in total grant funding to Africa and Asia although not to Latin America (see Figure D-2). The 1984-1985 mean grant size for all regions for projects involving the three priority technical fields ranges from $100,000 to $180,000 (see Figure D-3). The three joint-venture capital projects in Asia, which are each for more than $300,000, were included in calculating mean grant size. Because each of these grants involves smaller ventures, the mean investment in a core technology for these three projects is less than $100,000.3

A frequency distribution of grants by size intervals from $60,000 to $360,000 is shown in Figure D-4. Africa has seven projects in the $120,000 interval and none in the largest interval. Asia has eight projects, with at least one in each interval. Latin America has nine projects, with none in the largest interval.

Figure D-1. Number of Project Grants Funded Each Year by Region and Priority Technical Field.
Figure D-2. Sum of Grant Funds Each Year by Region and Priority Technical Field
Figure D-3. Mean Grant Size by Priority Technical Field and Region
Figure D-4. Frequency Distribution of Mean Grant Size by Region and Priority Technical Field

Under the Cooperative Agreement, ATI has reduced significantly the number of countries in which it operates -- from 45 to 20 at the time of the evaluation. Table D-2 lists the countries in which ATI operated before the Cooperative Agreement and those in which it currently operates. The reasons for dropping activities in a country were numerous: projects ended, projects were unsuccessful, implementing organizations no longer needed ATI assistance, or ATI did not have adequate resources for so many programs. The Cooperative Agreement does not specify selection of countries and ATI is free in principle to pursue opportunities as they arise. ATI's most common reason for not working in a country is a dearth of suitable nongovernmental organizations. Political stability is also a factor in these decisions. ATI is prohibited from working in communist countries and from investing further in countries in violation of specific provisions of U.S. law, such as the Brooke Amendment.{4}

{2}The Cooperative Agreement was signed in September 30, l983; two projects started after that date, but before January l984, were counted among the 1984 projects (see Table D-1).

{3}According to ATI, the range of investments within the venture capital company projects is from $24,000 to $95,000).

{4}ATI has four projects in Tanzania, which falls under the Brooke Amendment restrictions of AID project activity, and consequently the program there is being phased out.

2. COOPERATIVE AGREEMENT MANDATED EXPERIMENTATION WITH RISKY AND INNOVATIVE TECHNOLOGIES

ATI's mission is to demonstrate the commercial viability and economic sustainability of appropriate technologies and to facilitate widespread dissemination of the successful delivery strategies. In carrying out this mission, ATI experiments with alternative hard and soft technologies in various settings, using a range of cooperative organizations and financial arrangements. In short, ATI and its cooperating organizations experiment with both core technologies and the means of demonstrating their success in benefitting the rural and periurban poor.

2.1 Innovative Hard Technologies

Analysis of the hard technologies represented in ATI's project portfolio (Table D-3) reveals diverse innovative features.{5} Manufacture of intermediate goods (e.g., production equipment or machinery) is the most frequent innovative activity. Examples range from bamboo grass mats exported from Thailand to Korea for drying seaweed, to the 80-ton-capacity manual oil press manufactured in Tanzania, which enables villagers to engage in sunflower oil extraction. Rescaling a technology is the second most common innovation. This typically involves downscaling a modern technology to local small-scale production capabilities. However, as with the lime kilns in Botswana, the core technology is sometimes upgraded to "industrial scale."

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Table D-2. Countries With ATI Field Operationsa Before and After the Cooperative Agreement, by Region

Africa (and Pacific)b	Asiac	Latin America/Caribbean
Countries Added After Cooperative Agreement		
Zaire	None	Costa Rica
Zimbabwe		Peru
Countries in Which Field Operations Continued		
Botswana	Indonesia	Colombiad
Cameroon	Nepal	Dominican Republic
Kenya	Philippines	Guatemalad
Mali	Sri Lanka	Haiti
Tanzania	Thailand	Hondurasd
		Mexico
Countries in Which Operations Were Not Continued Under the Cooperative Agreement		
Burkina Faso	Bangladesh	Antigua
Fijib	Egyptc	Barbados
Gambia	Hong Kong	Bolivia
Ivory Coast	India	Brazil
Lesotho	Malaysia	Dominica
Malawi	Singapore	Grenada
New Caledoniab	Turkeyc	Jamaica
Niger		Nicaragua
Papua New Guineab		
Senegal		
Sierra Leone		

Solomon Islands
Somalia
Swaziland

aBefore the Cooperative Agreement, ATI established working relationships with many appropriate technology programs in various countries, but may not have supported projects in those countries.
bATI dropped the Pacific as a region.
cATI dropped the Middle East as a region.
dATI does not have country programs, only regional wheelchair subproject sites.

Source: ATI listing as of October l985.

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Table D-3. ATI Project Innovations: Hard Technologies

Nature of the Innovation (process or product)	Number of Times Found in Projects (examples)
Changed traditional technology by	
- reconditioning	1 (palm oil presses, Cameroon)
- revitalization of industry	1 (bamboo grass mats, Thailand)
- modifying	3 (wool spinning, computer-video training, protein-enriched cassava, Thailand)
- batch process to continuous	1 (lime kiln, Costa Rica)
Rescaled a technology by	
- scaling down	6 (e.g., brick kiln, Botswana; organic fertilizer, & coconut processing, Philippines; rhizobium, Thailand)
- scaling up	1 (lime kilns, Botswana)
Manufacture of intermediate goods for	
- local industries	5 (e.g., oil presses, Africa)
- dispersed production	2 (rhizobium, Thailand; cookstove, Kenya)
- export	1 (bamboo grass mats, Thailand)
Agricultural processing	
- at dispersed locations	3 (anguh maize mills, Mali coconut processing, Philippines; Shea nut butter, Mali)
- for export	1 (grapple processing, Botswana)

Input distribution
- improved supply ..... 3 (rural potteries, Tanzania; fish hatcheries, Indonesia; protein-enriched cassava, Thailand)

Quality impact
- high-quality product ..... 5 (e.g., bricks, Botswana, Tanzania; lime, Costa Rica, Botswana; rural potteries, Tanzania)

Nature of the Innovation (process or product)	Number of Times Found in Projects (examples)
Biotechnologies	2 (rhizobium and protein-enriched cassova, Thailand)
Energy Related	
- renewable energy source	6 (e.g., animal-driven pump, hydro-powered milling, Zaire; biogas refrigeration, turbine-driven agro-processing, Nepal)
- energy conserving	2 (cookstove, Kenya; potato processing, Peru)
Technology transfers:a	
- Thailand to Kenya to Haiti	2 (ceramic-lined cookstove)
- Canada to Mali, Zimbawe	2 (IDRC dehuller)
- Colombia, Mexico, Guatemala, Ecuador	1 (Linares pump)
- UK to Mexico	1 (ITDG corn planter)
- Brazil, Haiti	1 (cassava processing)
- North America, N Zealand to Nepal	1 (wool spinning)
- Belgium, U.K. to Tanzania, Botswana	2 (manual brick presses)

aA technology transfer is not per se an innovation, but noted transfers are listed here for information. The frequency is the number of transfers involved.

Source: Derived from ATI Memorandum to evaluation team (Corl to Delp 2/24/86).

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In at least three instances, innovative hard technology interventions produced improved inputs to other productive activities (e.g., shrimp production in Indonesia). Other innovative project elements frequently focused on quality, for example, developing a high-quality product that responded to

different customers in the market. Innovative elements in soft technology were often important as well in projects that focused on improved input distribution and quality (e.g., providing a standard production kit).

Although energy projects are not a priority technical field for ATI, at least eight projects utilized renewable energy sources (e.g., biogas refrigeration in Mali) or conserved dwindling energy sources (e.g., cookstoves in Kenya, processed potato-based foods in Peru, lime kilns in Costa Rica).

{5}The evaluation team analyzed ATI information on the innovations in its demonstration projects through key words and readily identifiable categories to gain insights into the nature and frequency of the innovative features. It is not exhaustive, but gives a better picture than simply describing hard and soft technologies.

2.2 Diversity of Soft Technologies

A variety of soft technologies, including financial and organizational innovations, support productive activities in ATI's projects (see Table D-4). There were five instances of innovative input distribution modes, ranging from the distribution of improved swine feed through rural cooperatives in the Dominican Republic to the use of biogas refrigeration units in Mali to enable animal vaccine distribution. Quality improvement innovations were introduced in five projects through the transfer of quality control technology. In at least four instances, standard production kit innovations were aimed at ensuring consistent quality, an indication that product quality is a prominent feature of ATI's experimentation. Input distribution and improved quality account for 17 of the hard and soft technology innovations identified.

Three innovations involved the provision of marketing assistance and four involved the provision of a package of services -- including technical, financial, and marketing assistance. In Kenya, the private enterprise that is the principal subcontractor to the cookstoves project is also actively engaged in market development for the village-based cookstove assemblers. The contractor identifies established shops, initiates sales with quality products from his own workshop, then transfers the source of supply to the local assembler, who is trained in cookstove assembly in the contractor's workshop.

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Table D-4. ATI Project Innovations: Soft Technologies

Nature of the Innovation	Number of Times Used in Projects

(Examples)

Input distribution:
- innovative distribution mode ..... 5 (animal vaccines, Cameroon; organic fertilizer, Philippines; swine feed, Dominican Republic; rhizobium innoculant; farm support enterprises, Mexico)

Quality impact:
- quality control ..... 5 (wool spinning, Nepal; organic fertilizer, Philippines; industrial salt, Philippines; wheelchairs, Latin America/ Caribbean; cookstoves, Kenya)

Marketing assistance ..... 3 (rhizobium, Thailand; cookstove, Kenya; swine feed, Dominican Republic; grapple, Botswana)

Franchising system ..... 1 (organic fertilizer production, Philippines)

Providing standard production kit ..... 4 (wheelchairs, Latin America/ Caribbean; coconut processing, mushroom growing, Philippines; cookstoves, Kenya)

Package of services:
- technical, financial, marketing ..... 3 (lime kiln, Botswana; brickyards, Tanzania; wool spinning, Nepal)

Commercial Loan Fund
- existing organization ..... 5 (e.g., shea nut butter, Mali)
- creating new company ..... 1 (village oil processing, Tanzania)

Nature of the Innovation	Number of Times Used in Projects (Examples)
Loan Guarantee Arrangementa (if approved by AID) 1	(hydro-powered milling, Zaire)
Venture capital organization 3	(Thailand, Philippines, Indonesia)
Agro-industries company 2	(Mexico, Zimbabwe)

Fostering PVO, NGO cooperation with business ..... 4 (Thailand, Philippines, Indonesia, Mexico)

Local capacity building ..... 2 (oil press manufacture, hydro-powered grain milling, Zaire)

Source: Derived from ATI Memorandum to evaluation team (Corl to Delp 2/24/86).

aPending AID approval.

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Other innovative soft technologies involve financial and organizational arrangements for starting and managing small-scale enterprises. These include franchising plans, loan guarantees, three venture capital organizations investing in productive activities in South East Asia, two agro-industrial companies, and four cases of cooperation between a private voluntary organization (PVO) or nongovernmental organization and private businesspeople.

The most common soft technology innovation involves changes in an extraordinarily commonplace mechanism: the commercial loan fund. The innovation can be focused on the implementing organization (e.g., a PVO without experience in for-profit operations, such as the Arusha Evangelical Synod) the organization the loan fund will serve (e.g., women's groups), or the type of transaction (e.g., lease-purchase arrangements).

2.3 Appropriateness of Project Mix

ATI has established an appropriate mix of projects in its portfolio, some more innovative and thus inherently more risky than others. The evaluation team identified a total of 20 types of innovations (see Tables D-3 and D-4): 43 innovations stem from the hard technologies of the project; 39 relate to soft technologies, including financial or organizational arrangements. The average is two innovative elements for each of the 36 projects analyzed, but the frequency is not uniform. For example, the rhizobium-inoculant project in Thailand accounts for five of the innovations identified in Tables D-3 and D-4.

Given ATI's experimental mission, it could be argued that there should be more discernable innovations in the ATI projects. However, the number of variables affecting technical, organizational, and commercial risk must be limited if a project's success is not to be jeopardized. Risk can be better controlled by having fewer rather than more innovative elements, each of which introduces additional uncertainty into a project.

Observation and analysis suggest that ATI has reached a balance of innovative elements within projects, although not by design. Thus if the hard technology of a project is innovative and high risk, the project tends to be placed with a well established organization and familiar financial arrangements are used; if the hard technology has been proven feasible, then other soft elements of the project design are sometimes more innovative. Although this appears to be the case in ATI's operations, ATI has not systematically identified innovative aspects of its projects as a part of design and management. For instance, innovative elements of the projects have been treated explicitly in the project plans only since November l985, following negotiations between S&T and ATI. To improve its experimental output, senior management of ATI need to ensure that even more attention is paid to identifying the innovative elements of ATI's demonstration projects, especially with regard to the soft technologies. This concern with the handling of innovation is particularly germane to ATI's replication strategy and its capability to carry it out (see Appendix H).

APPENDIX E

WHO ARE ATI'S PARTNERS AND HOW DOES IT SELECT AND WORK WITH THEM?

1. ATI works through locally based organizations -- primarily PVOs -- who in turn work with small-scale private companies.

   1.1 ATI's cooperating organizations are directed toward economic development and technology development or dissemination with a focus on the poor.

   1.2 ATI's cooperating organizations are mainly in the private sector.

2. ATI's cooperating organizations are critical intermediaries and their services and relationships to small-scale enterprises are important.

3. ATI identifies project partners well, is sensitive to their needs and capabilities, and is committed to long-term development, not short-term intervention.

ATI'S SELECTION OF AND RELATIONSHIP WITH ITS PARTNERS

1. LOCALLY BASED ORGANIZATIONS AND SMALL-SCALE PRIVATE COMPANIES

ATI works to achieve its end goal of benefiting the rural

and semiurban poor principally through the 58 cooperating organizations in its projects and through the core technologies it promotes. As described in Appendix A, ATI establishes close formal and informal relationships with cooperating organizations to identify local needs and opportunities and to carry out demonstration projects. The implementing organization holds the grant, and other organizations may be involved as intermediaries subcontracted by the implementing organization or directly by ATI. The Cooperative Agreement performance target requires that 75 percent of ATI's projects be contracted to small-scale enterprises, associations of small-scale enterprises, or organizations working closely with small-scale enterprises. The evaluation team used this criterion in its examination, but looked to other sources as well to develop a more comprehensive characterization of all of ATI's cooperating partners. The categorization and discussion that follow are based on the institutional descriptions in ATI's Project Monitoring and Evaluation System questionnaires. Attributes of ATI's cooperating organizations, including the project implementing organization, and other intermediary organizations, had been identified, although the questionnaires were incomplete (see Appendix G). Organizations may have more than one attribute, and hence the categorizations are not mutually exclusive.

1.1 The Focus of ATI's Cooperating Organizations

ATI's cooperating organizations are directed toward economic development and technology development or dissemination, with a focus on the poor. Half (29) of ATI's cooperating organizations are related to small-scale enterprise development through technology or economic development activities; almost one-third (18) are small-scale enterprises; 7 percent (4) are cooperatives. Figure E-1, presents the relationships of all cooperating organizations to small-scale enterprises and other categories.

Figure E-1

The seven organizations categorized as exclusively{1} social or community development-oriented constituted only 12 percent of the sample, and four of the seven are associated with the Latin America and Caribbean region wheelchair project (assisting the handicapped in the project countries).

The few relationships with cooperatives and social welfare-oriented agencies have been strengthened by the emphasis on commercially viable and economically sustainable activities. ATI has moved several of these and other private voluntary organizations (PVOs) into promotion of productive activities for the benefit of the poor. Overall, this distribution of organizational types has given ATI a range of possibilities from which to experiment with alternative approaches.

Project implementing organizations can be distinguished from

other intermediaries involved in ATI projects. The 33 project implementing organizations were organizations promoting economic development (40 percent) or technology development and dissemination (33 percent), or both. None of the implementing organizations was a cooperative; 20 percent were social or community development organizations.

Before working with ATI, the implementing organizations differed by a factor of as much as 1000 in size of staff and budget. Budgets prior to ATI grants ranged from US$10,000 to US$10 million. All of the implementing organizations had been established between 1971 and 1985. On the average, the implementing organizations were founded around 1975.

Most of the 25 other intermediary organizations were small-scale enterprises (60 percent) or cooperatives (16 percent) directly managing the productive activity of each project. The remaining intermediary organizations were characterized by ATI as economic and technology development organizations.

{1}That is, "exclusive" in the sense that other attributes such as "economic development" or "technology dissemination" were not indicated for these organizations on the questionnaires.

1.2 Emphasis on Private Sector Cooperating Organization

Twenty-seven (47 percent) of ATI's cooperating organizations were PVOs; 18 (31 percent) were private companies. Less than 9 percent (5) were government agencies,{2} and less than 7 percent

Thus, in general, ATI implements the projects through PVOs, who in turn work with small-scale private companies and occasionally a cooperative to promote the use of the core technology in a productive activity. The implementing organizations are related to small-scale enterprises mainly through their promotion of economic development, technology development, and dissemination. In this approach, ATI uses indirect means of benefiting the poor through the transfer of appropriate technologies to small-scale enterprises.

Figure E-2

{2}In reviewing the evaluation team's analysis, ATI notes that the number of government agencies are overestimated. Only the Mahaweli Authority in Sri Lanka is clearly a government agency. The error may be in identifying parastatals as government agencies. (4) were parastatals or development banks (Figure E-2.) Three-quarters (25) of ATI's implementing organizations -- as distinct from its other intermediaries -- are primarily PVOs working directly with or otherwise serving small-scale enterprises. Four implementing organizations (12 percent) are private companies. Other intermediaries are predominantly private companies (56 percent) and only two are PVOs.

2. IMPORTANCE OF ATI'S COOPERATING ORGANIZATIONS AS INTERMEDIARIES TO SMALL-SCALE ENTERPRISES

ATI's cooperating organizations are critical intermediaries, and their services and relationships to small-scale enterprises are important. Complete data from ATI's Project Monitoring and Evaluation System was available for 36 implementing organizations and 22 other intermediary organizations{3} on their intended relationships to project participants (i.e., the small-scale enterprises carrying out productive activities) (see Table E-1). The most common relationship between the implementing organization and project participants was as provider of managerial assistance -- 33 (92 percent) of the implementing organizations in ATI projects. Technical assistance or training was provided by implementing organizations in 31 cases (86 percent) and credit assistance in 20 (56 percent) of the relationships. Other intermediaries were engaged mainly in ATI projects to provide technical assistance or training (86 percent) and managerial assistance (55 percent). In more than 90 percent of the relationships where credit was provided by the implementing organization or other intermediary, technical assistance and/or management assistance was also provided.

The implementing organizations and other intermediaries were directly involved in marketing assistance for the project participants in 39 percent and 32 percent of the cases, respectively. Other assistance (e.g., providing inputs or buying products) was also provided, but less frequently. Implementing organizations own an equity share in 36 percent of the projects and provide a grant or subsidy in only 3 cases (8 percent of the implementing organizations).

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Table E-1. Relationships of Implementing Organizations to Project Participants

Organization's Relationship to Participants	Implementing Organization (No.)	(Percent)	Other Intermediary (No.)	(Percent)	All Cooperating Organizations (No.)	(Percent)
Provides grants or subsidies	3	8	0	0	3	5
Owns equity share	13	36	4	18	17	29
Provides credit	20	56	8	36	28	43
Provides technical	31	86	19	86	50	86

assistance or training						
Provides managerial assistance	33	92	12	55	45	78
Provides inputs	8	22	7	32	15	26
Assists in marketing	14	30	7	32	21	36
Buys their products	9	25	1	5	10	17
Represents them in policy discussions	9	25	3	14	12	21

Source: Analysis of raw data from ATI's Project Monitoring and Evaluation System, as of December 1985.

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The cross-tabulation of relationships to participants with the type of implementing organization was generally inconclusive because of the small numbers involved. One finding, however, was that marketing assistance was provided by PVOs and private companies that were clearly focused on technology and economic development.

{3}Three of the implementing organizations were counted twice, once for each project in which they are involved in a separate relationship with a distinct participant.

3. ATI IDENTIFICATION OF PROJECT PARTNERS AND COMMITMENT TO LONG-TERM DEVELOPMENT

ATI identifies project partners well, is sensitive to their needs and capabilities, and is committed to long-term development, not short-term interventions. ATI's selection of project implementing organizations and other intermediaries is critical to its mission. ATI's 1986 Annual Workplan identifies the following criteria for selecting a project partner:

-- The capacity to manage funds and a willingness to have the project monitored and evaluated

-- Technical skills available in-house or through other collaborating organizations

-- Commitment to sustainable development (e.g.,

development approach not dependent on assistance grants or subsidies for long-term viability.) (p. 16).

Furthermore, ATI normally looks for a significant contribution in cash or kind from the project partner.

In evaluating ATI's performance under the Cooperative Agreement and in the context of ATI's mission (i.e., to act as a "catalyst in the appropriate technology process"), the evaluation team was impressed by the relationship between ATI and its cooperating organizations. The commitment and capabilities of all concerned and the evidence of learning and growth in the relationship were strongly present in all the projects visited. The relationship to several of ATI's project partners in Asia extends to the earliest days of ATI's field program. These enduring associations apparently have been mutually beneficial.

The evaluation team asked the Director of Field Operations why ATI's project planning process and documents seemed to include much more detail on the technical concerns than on the organizational aspects of its projects. The reply was that ATI's staff were already strong on institutional assessment and that the content of the plans reflects ATI's intention that each project be focused on a core technology and its commercialization. Appendix F presents the results of evaluating each institution, productive activity, and core technology in 18 of ATI's projects. Linkages among ATI, the cooperating organizations, the promoted productive enterprises, and the poor are evaluated as well.

APPENDIX F

WHAT ARE THE FINDINGS ON ATI's FIELD PROJECTS? ARE THEY SUCCESSFUL, OR LIKELY TO BE?

1. Field evaluations

   1.1 The evaluation team examined at first hand 18 ATI projects comprising 20 productive enterprises carried out by 16 implementing organizations in 10 countries.

   1.2 In November 1985, ATI and the cooperating organization were at an early stage in establishing productive activities in all but a few projects.

   1.3 ATI's projects involved innovative and risky productive activities with potential for commercial viability. Technology development was well along in all but five projects.

2. Assessment of commercial viability and economic

sustainability

2.1 Because the productive activities visited were in a very early stage, the evaluation team's assessment of the likely commercial viability and economic sustainability of the productive activities under each project was limited.

2.2 Generally, the ATI projects are establishing productive activities with good prospects for commercial viability.

2.3 Prospects for economic sustainability appear to be slightly less optimistic than those for commercial viability.

3. Assessment of ATI's planning appraisals for the projects visited

3.1 In general, ATI's technical assessment has been good; however, more independent cross-checking and clear intermediate decision points would improve design and implementation efforts.

3.2 ATI does not have a clearly defined strategy for taking prototype technologies from the laboratory to commercial use.

3.3 The Evaluation Team found wide variations across ATI projects in the appraisal of commercial viability and markets.

3.4 Given the typically high level of market uncertainty, ATI's assessments of the risks inherent in many of its projects are not sufficient for designing risk neutralization schemes (e.g., marketing strategies for the productive enterprises).

3.5 In the projects visited, ATI did not consistently carry out a standard analysis of the market for a new product before project implementation.

4. The transfer of soft technology

4.1 ATI's most innovative experiments with soft technologies are in venture capital projects.

4.2 ATI's efforts to transfer soft technologies to productive enterprises have not been consistently aimed at identified gaps in the capability of the enterprises.

4.3 ATI's soft technology transfer to the implementing organizations has been varied yet unevenly applied.

5. ATI's impact on the rural and semiurban poor

EVALUATION FINDINGS ON THE LIKELIHOOD OF THE SUCCESS OF ATI'S FIELD PROJECTS

1. FIELD EVALUATIONS

1.1 Projects Evaluated

Field trips were made to each region to assess ATI's effectiveness in demonstrating commercially viable and economically sustainable activities utilizing appropriate technologies. The field evaluations assessed three separate aspects of ATI field projects and operations:

- The state of development of each hard technology and the likely commercial viability, economic sustainability, and replicability of the demonstration projects

- ATI's performance in assessing the potential of the core hard technology for commercialization and in assessing the specific productive activity's commercial viability, including market factors

- Soft technology transfers among ATI, cooperating organizations, and supported enterprises

In accordance with the Cooperative Agreement, 10 projects were designated by ATI for the mid-term evaluation. Because few baseline data were available for these 10 projects and their productive activities had only recently begun, the evaluation team visited all l8 projects underway in the 10 countries visited. These comprised half of the 36 Cooperative Agreement projects contracted worldwide as of December 1985. (See Evaluation Methodology, Appendix B.) These projects involved 20 productive activities carried out by 16 implementing organizations. (Some organizations implemented more than one project, and some projects had more than one implementing organization.)

Table F-1 lists the projects in the countries visited; identifies priority technical fields, productive activities, and implementing organizations; and provides information on grant amounts, disbursements, and duration of the projects. Detailed descriptions of each project are available in the regional evaluation reports (Delp and van Blarcom 1986; Turner and Ulsaker 1986; Velasquez and Halvorson 1986). A comparison with Table D-1 indicates that the sample is representative of ATI's total portfolio in terms of average project grant size, selection of priority technical fields, and types of cooperating organization.

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Table F-1. ATI COOPERATIVE AGREEMENT PROJECTS VISITED BY EVALUATION TEAM

Project No.	Priority Tech. Field1	Productive Activity	Implementing Organization2	Grant Country	Term US $	Obligation (Years) Date
Africa						
84-01	ESF	Animal Driven Pumps	RIIC/RIP	Botswana	108,000	3 10/01/83
84-0058	LMR	Brick Production	MHT/SRDA	Botswana	90,400	3 06/29/84
84-0102	APP	Oil Press Production	CAMARTEC	Tanzania	112,276	3 06/29/84
84-0103	LMR	Rural Potteries	CAMARTEC	Tanzania	97,512	3 06/29/84
84-0335	APP	Village Oil Press	LWR/ELCT	Tanzania	142,676	4.3 11/02/84
84-0513	LMR	Improved Bricks	CAMARTEC	Tanzania	156,452	3 11/02/84
84-0680	LMR	Lime Production	MHT/SRDA	Botswana	95,000	3 12/20/84
85-0001	APP	Grapple Processing	T-L	Botswana	37,100	3 03/28/84
85-0009	LMR	Ceramic-Lined Jikos	KENGO	Kenya	248,973	3 05/16/84
Asia						
84-16	ESF	Rhizobium Inoculant	SVITA	Thailand	137,700	2.5 04/01/84
84-0226	APP	Rural Small Scale Industries (RSSI) Bamboo Grass Mats	PDA	Thailand	310,733	6 11/01/84
84-0290	APP	Protein-Enriched Cassava	PDA	Thailand	210,300	2.5 07/01/84
84-0389	APP	Rural Small Industries Development (RSID) Mushroom Growing Coconut Processing	FFI	Philippine	367,440	5 03/01/85
84-0709	APP	Wool Spinning	ACP	Nepal	165,144	4 12/01/84
84-0775	APP	Turbine Agro-Processing	NEW ERA	Nepal	29,959	3 01/01/85
LA/C						
84-13	LMR	Lime Kiln Technology	C/ITCR	Costa Rica	144,514	4 05/01/84
84-20	APP	Swine Feed Technology	CIMPA	Dom Repub	160,977	2.5 06/01/84
84-0631	TDO	Wheelchairs	LA/C		300,800	2 01/01/84
		Honduras Site	FUHRIL	Honduras	9,000	1.5 07/15/85
		Guatemala Site	CERVOC	Guatemala	6,000	1.5 07/15/85

1. Priority Technical Fields
   APP Agricultural Products Processing and Agricultural Waste Utilization
   LMR Local Mineral Resources
   ESF Equipment and Support for Small Farms
   TDO Truly Unusual Opportunity

2. Implementing Organizatons are described in Appendix E.

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1.2 Stage of Project Activities at the Time of the Evaluation

In November 1985, ATI and the cooperating organizations were at an early stage in establishing productive activities in all but a few projects. Productive activities in five of the nine projects visited in Africa had only recently started operations, and the others were likely to begin within months, except for the Tanzania brickyard project. The latter had experienced equipment procurement delays and problems in finding a brickyard site. Nonetheless, alternative brick press and clay crusher technologies were being tested as of November 1985.

In the Asia region, wool spinning in Nepal and bamboo grass mat production in Thailand had begun several months before the evaluation. Other projects were about to begin production, with the exception of the protein-enriched cassava project in Thailand, which was still in the technology development phase.

Productive activities in the Latin America and Caribbean region were underway for the swine feed project in the Dominican Republic, not yet ready to begin for the lime kiln project in Costa Rica, and still being organized for the wheelchair project sites visited in Honduras and Guatemala.

1.3 Nature of Project Activities

ATI's projects involved innovative and risky productive activities with potential for commercial viability. Technology development was well along in all but five projects. Congress and AID intended that ATI should experiment, be innovative, and bring to market technologies with a high potential payoff for the benefit of the poor. ATI has indeed experimented in ventures to promote productive activities with a potentially high payoff and that are also high risk because the core technology is unproven or the market, although promising, is undetermined. Hard technologies examined that were risky, experimental, and innovative, included rhizobium inoculant and protein-enriched cassava in Thailand, lime kiln technology in Costa Rica and Botswana, local processing of grapple (a medicinal root crop) in Botswana, oil seed processing in Tanzania, and ceramic-lined cookstove production in Kenya.

In most cases, ATI works with cooperating organizations to identify and bring a tested technology to commercial production. The technology is adapted and demonstrated in a new setting. In such cases risk assessment and risk management depended mainly on close attention to commercial viability and market development, as discussed in Section 3.

However, in some projects, ATI tests an unproven technology before commercial demonstration, either in field laboratories or in pilot installations. In Africa, development and testing of core technologies were ongoing in nearly every project. The Tanzania rural potteries and Botswana brickyard projects had just demonstrated feasible core technologies in established enterprises and were being refined for production. The oil pressing technology in Tanzania and the ceramic-lined cookstoves in Kenya had proven technically feasible, but experimentation with the processes was still under way. The implementing organization for the animal-driven pump project in Botswana had demonstrated the feasibility of the hardware (the pump transmission) but was building a new, sturdier prototype and experimenting with sociotechnical system aspects (e.g., the organization of borehole users) at the time of the field trip. The project had been one of the first signed under the Cooperative Agreement.

In Asia, several hard technologies had required considerable development and/or adaptation by the implementing organizations and were only just being taken up by individual productive enterprises. The technologies for the protein-enriched cassava project and rhizobium production were still under development. On the other hand, wool spinning in Nepal -- although a new introduction to the project area -- was based on a centuries-old technology from Europe, and bamboo grass mat production employed an existing hard technology.

The three projects visited in the Latin America and the Caribbean region were using core technologies that were more developed than most of those in Asia and Africa. The regional wheelchair project and the swine feed project technologies were essentially proven, and the lime kiln design had been sucessfully tested in a half-scale pilot plant.

In summary, the development of core technologies was well along in all but five projects. Moreover, three of the latter (the Thailand protein-enriched cassava, the Thailand rhizobium, and the Tanzania brickyard projects) were focused specifically on research and development aspects because of the high potential pay-off.

2. ASSESSMENT OF COMMERCIAL VIABILITY AND ECONOMIC SUSTAINABILITY

2.1 Early Stage of Productive Activities

Because the productive activities visited were in a very

early stage, the evaluation team's assessment of the likely commercial viability and economic sustainability of the productive activities under each project was limited. Records of sales, raw materials and other costs, profits and losses, and overhead were not yet available to provide a quantitative base for assessing the commercial viability of production. Nonetheless, the evaluation team was able to judge the prospects of each project on observed or inferred merits, weighing a variety of technical, financial, and marketing factors. Although necessarily speculative, the team's assessments were based on direct observation at each project site, interviews in the country, and examination of ATI and other studies. In some cases (e.g., in the Philippines and Thailand), the team found that data gathered by the implementing organizations was quite useful, including local consumer surveys (mushroom production), marketing studies (rhizobium), and product quality and acceptability studies (protein-enriched cassava). During the time allowed in each country, the evaluation team sought independent judgments of market prospects and socioeconomic climate, drawing on government officials, the donor community, industry spokesmen, and competitors. An ATI staff member was also available to answer questions at each project site.

2.2 Prospects for Commercial Viability

Generally, the ATI projects are establishing productive activities with good prospects for commercial viability. However, several projects involved significant uncertainties, such as in input and product markets. The evaluation team, taking the view of an investor looking for new ventures, did not always agree with risks identified or implied in the project plan assessment of commercial viability.

The African enterprises with the greatest likelihood of commercially viable operations are the oil press production project, the village oil processing project, and the rural potteries project in Tanzania. In Asia and Africa, the evaluation team considered almost half (5) of the remaining projects to be clearly commercially viable and reserved judgment on the other half (6). The Latin America team considered the swine feed and lime kiln projects to have good commercial prospects once they overcame emerging input supply problems (molasses additive for the swine feed and fuelwood for the kilns).{1}

The reasons for these favorable assessments include market, technology, and managerial factors. For example, the largely unmet demand for edible oils in Tanzania ensures high returns to oil processors. The enterprise producing fire bricks and glazes in the rural potteries project has strong management with a successful record in many ventures. The lime kiln technology developed in Costa Rica economizes on fuelwood and produces a higher quality lime, thus increasing significantly the gross margins for lime production. In the bamboo grass mat project,

the interest of the piece workers -- many of whom had several years of experience in mat production -- in investing in equity shares of the enterprise is an indirect indicator of its potential.

In each region the evaluation team found one project promoting productive activities whose commercial viability was in doubt:

-- Protein-enriched cassava in Thailand. ATI has set a target for technical feasibility which promises a potentially high payoff but has yet to be reached;{2}

-- Animal-driven pump in Botswana. The people who most need it are located in remote desert areas and are least able or likely to organize to pay for it.

-- Wheelchair production in Guatemala and Honduras. Although it was too early to assess fully, the team believed that ATI had not provided sufficient preparation and planning to the implementing organizations for adequately developing the potential for commercially viable enterprises.

{1}ATI disagrees with the concern about fuelwood supply for the Costa Rica lime kiln project.

{2}ATI notes that "it is not expected that every demonstration project will turn out to be commercially viable; this is especially so for technology development projects." (Appropriate Technology International, "Specific Comments on the Main Report Draft of the AID Mid-Term Evaluation of ATI," 1956, p. 26).

2.3 Prospects for Economic Sustainability

Prospects for economic sustainability appear to be slightly less optimistic than those for commercial viability. However, given the early stages of most ATI projects in November l985, the assessment of economic sustainability is speculative. Prospects for widespread sustained economic benefits are best in the coconut-processing project in the Philippines, the rhizobium inoculant project in Thailand, and the village oil processing project in Tanzania. Factors influencing these judgments include the promising potential of the core technology, the previous experience of the implementing organization, and market situations characterized by high levels of unsatisfied demand.

In eight of the projects, it was too early in project development to indicate long-term prospects. The sustainability of three other projects was questionable.

-- The brickyard enterprise in Botswana has had management and technical assistance shortcomings which stem from broader structural problems in the implementing

organization; the close proximity of alternative brick suppliers in the Republic of South America requires more intensive management and marketing strategy for the enterprise, including attention to exploitation of high quality clay deposits nearby.{3}

-- The lime kiln project in Costa Rica, while judged by the team to be commercially viable in the short term, has yet to resolve the issue of fueling the kilns in the long term.{4}

-- The regional wheelchair project activities in Guatemala and Honduras are not likely to be sustained without significantly improved management on the part of both ATI and the implementing organizations.

The evaluation team was undecided about the commercial viability of several projects, but more optimistic about long-term prospects for the productive activity (e.g., coconut processing, rhizobium inoculant, and agro-processing in Nepal). This is due in part to a considerable potential for widespread replication if commercial viability is achieved.

{3}ATI acknowledges the management problems (and has taken decisive action in the field) but disputes the evaluation team's concern with competition over clay deposits or South African bricks.

{4}The issue of the supply of wood for fueling the kilns was unresolved. The evaluation team recognizes that the improved technology is more fuel efficient, that scrapwood was available at the time of the field visit, and that present kiln wood use is not a significant part of overall wood demand. There is no guarantee that these factors will hold for a typical investment period necessary to justify kiln improvements (e.g., 10 years).

3. ASSESSMENT OF ATI'S PLANNING APPRAISALS FOR THE PROJECTS VISITED

3.1 ATI's Technical Assessments

In general, ATI's technical assessment has been good; however, more independent cross-checking and clear intermediate decision points would improve design and implementation efforts. ATI literature stresses the importance of technical assessment and commercial analysis to its projects.{5} In view of the state of development of most of the core technologies in the products and the fact that most productive activities were not yet in operation, these pre-project assessments are especially significant to the evaluation.

In general, ATI's assessment of the technical feasibility of each project technology has been well done. Several projects (including the wheelchair, the Tanzania oil press, and the

rhizobium projects) provided for studies by outside consultants. The brickyard project in Tanzania was designed to test alternative brick-pressing technologies: The United Kingdom's Intermediate Technology Works brick pressing system and clay crushers are being tested against Belgian-designed technology.

Nonetheless, the Africa projects visited, except the grapple-processing project in Botswana, should have had better pre-project assessments of the core technologies. Several of ATI's projects could have benefited from explicit inclusion of technical assessment as a component of the appropriate technology delivery strategy.

Better and more timely assessment would have undoubtedly led to changes in several projects. For example, when the animal-driven pump project technology in Botswana was evaluated by an experienced British production engineer 20 months after the project was initiated, he was highly critical. In addition to production engineering changes to improve the original design, he also proposed building a smaller size pump. This has the advantage of requiring fewer animals, thus alleviating some of the social-organizational complexities of operating the pump.

In general, projects in Asia received the best overall technical feasibility assessments, due in large part to the capability and interest of the implementing organizations. Those of the three Latin America projects visited were considered adequate, principally because of the expertise of the implementing institutions and staff working on each project.

Some projects incorporated implementation stages that allow for go/no go decisions on continuing the technology development. In Asia, for example, ATI has generally given the five implementing organizations considerable latitude in testing and adapting technologies. ATI technical staff are brought in periodically on an as-needed basis, but intermediate check points are not generally established prior to ATI's final go/no go decision on a proven technology. An exception is the rhizobium inoculant production project, which had preplanned tracking indicators. The development of hard and soft technologies in other projects could benefit from similar mechanisms. The protein-enriched cassava project has a late go/no go decision point -- at the end of the technology development phase. Costa Rica's lime kiln project has a similar two-tiered design of, first, technology development, followed by establishment of commercial operations.

{5}"ATI's current project portfolio is developing and testing models for the successful widespread dissemination of appropriate technology. Projects emphasize technologies that add value to resources owned or controlled by the poor. Project development is based on the premise that technologies, after an initial development period, have to be self-sustaining. Productive activities employing a new, or newly adapted, technology must be commercially viable. Technical assessment and commmercial analysis are critical components in ATI's project

appraisal." (Appropriate Technology International, Appropriate Technology Bulletin, No. 2, July l984. [emphasis added]).

3.2 Commercialization Strategy

ATI does not have a clearly defined strategy for taking prototype technologies from the laboratory to commercial use. For example, the technology for the edible oil press project in Tanzania was to be developed by the Institute for Production Innovation (IPI) in Dar Es Salaam. Infrequent and ad hoc communications between IPI and the ATI-funded productive enterprise in Arusha resulted in the latter manufacturing outdated, less efficient, and more costly models. In the meantime, ATI's newly hired farm equipment specialist was fabricating and testing a much smaller prototype press of his own design back in Arusha. The evaluation team observed an exciting and dynamic competition among alternative designs. However, the two oil press projects (promoting manufacture of the presses and processing in villages) had gone ahead on the basis of a proven, but static, conception of the technology instead of providing in the project design and implementation schedule for continual technology monitoring, assessment, and adaptation. Such a process might have been facilitated by formally including IPI in the project.

Several ATI projects had overoptimistic schedules for commercializing the technology, considering the developmental stage of the technology (lime kiln in Costa Rica, protein-enriched cassava in Thailand). Other projects would have benefited from more realistic time frames based on sounder initial technical assessment. When the core technology has been assumed to be technically proven although much developmental work remains in adapting it to a particular organizational context, then scheduling ambitious levels of production is indeed risky (e.g., the animal-driven pump project in Botswana).

3.3 ATI's Appraisals of Commercial Viability

The evaluation team found wide variations across ATI projects in the appraisal of commercial viability and markets. Commercial analysis for the various productive enterprises ranged in sophistication from apparently back-of-envelope calculations to detailed monthly cashflow analyses. The adequacy of the analysis often corresponded to the apparent attention paid to marketing factors. Costing out the factors used in the production process and those required to achieve a target quality of product is essential to sound business planning, whether for setting prices in an established market or for new product development. Evidence of sound business planning was missing in some ATI-assisted productive enterprises.

Planning for ATI's Africa region projects included

commercial break-even capacity analyses based on ATI's commercial analysis manual (see Appendix G). The analysis involves costing out the production process to arrive at a projected level of capacity utilization that will allow the enterprise to break-even. Most of the African commercial assessments were expanded to show comparisons between alternative technologies, alternative scenarios for costs and prices, cashflows, and rates of return. The oil press production project in Tanzania and the Kenya cookstove project had very thorough commercial analyses.

Several underlying assumptions in the Africa projects were questionable, such as basing production levels on unproven technical performance levels, as in the Botswana lime kiln and animal-driven pump projects. The latter had an inadequate market study with unwarranted assumptions of demand for the pump technology. The commercial assessment for the rural potteries project was very good, despite the Africa evaluation team's concerns about the adequacy of the market study and about the likely beneficiaries (see Section 5).

In the Asia region, the assessments of commercial viability were very good in the two venture capital projects visited: the Philippines Rural Small Industries Development project promoting coconut-processing and mushroom-growing ventures and the Thailand Rural Small-Scale Industries venture into revitalizing bamboo grass mat production. In each case, the implementing organization is a large, well-staffed development organization with established financial analysis capabilities. (Earlier efforts by ATI under the grant helped establish this capability in the Thai implementing organization.) Assessment by ATI of the commercial prospects for wool spinning in Nepal was also satisfactory. ATI's assessment of the commercial viability of the rhizobium inoculant and protein-enriched cassava production activities were adequate, considering ATI's deferral of detailed analysis until technical feasibility was ensured.

With ATI assistance, the venture capital projects visited in Asia had developed a business plan format to analyze and present new ventures. Although this approach was supported by ATI, it has not been incorporated into other project analyses in the region; nor would it necessarily be appropriate for less sophisticated implementing organizations with more limited resources. These business planning procedures are generally too complex to be readily adapted for use in day-to-day management of small business operations.

3.4 ATI's Risk Assessments

Given the typically high level of market uncertainty, ATI's assessments of the risks inherent in many of its projects are not sufficient for designing risk neutralization schemes (e.g., marketing strategies for the productive enterprises). The greatest uncertainties facing an ATI project concern the market for the products generated from the core technology or process

(e.g., buyers, potential buyers, and competitors); the market for key inputs (local suppliers, importers); and the demand for the technological process (i.e, the market for the project's core technology).

The field evaluations found several deficiencies in the analysis of demand for the technology or its products (e.g., the animal-driven pump project in Botswana, the lime kiln project in Costa Rica, and the wheelchairs regional project in Guatemala and Honduras) or of the market for input supplies (swine feed in the Dominican Republic, lime kilns in Costa Rica). The Latin America and Caribbean region evaluation found generally poor or nonexistent commercial and market analyses for the three projects visited. More recent project plans contain better commercial analyses.

Of the three Latin America and Caribbean projects visited, only the swine feed project was found to have an adequate commercial analysis and marketing study. The commercial assessments for both the lime kiln project and the regional wheelchair project were grossly inadequate in the view of the evaluation team members visiting the field sites. The study of the market for quality lime products lacked specificity. The analysis of available sources of fuelwood for the kilns should have been carried out earlier in the project cycle. A special study of forest plantations and fuelwood availability -- conducted as a result of concerns raised by ATI's Executive Director -- showed limited supply and estimated low returns on plantation investment. The weaknesses in the commercial aspects of planning and appraising the lime kilm project contrast significantly with the attention devoted by ATI to assessing and monitoring the development of the core technology in that project.

Similarly, the commercial and market assessments for the wheelchair project sites visited were either inadequate or nonexistent. The general calculations for wheelchair production that were included in the regional project plan were not adjusted to reflect the local costs of materials and the market situation in the Central American implementation sites. Implementing organization staff were unable to provide the evaluation team with information on the cost of imported wheelchairs, the supply available in country, government subsides, if any, and similar information. These seem to be rather basic questions, which should have been addressed before the project.

3.5 Market Analysis

In the projects visited, ATI did not consistently carry out a standard analysis of the market for a new product before project implementation. In a venture based on an unproven process technology, the production costs, volume, and achievable quality of the product are undetermined. Yet, production costs, technical performance, and market considerations are closely linked and need careful attention in such projects. Quality

improvement is a significant innovative feature in many of the ATI projects, and quality is closely tied to marketability and sustained profits. A market study need not wait for the core technology to be proven feasible. Rather, the market can provide a target for gauging the development of the technology, as occurred in the protein-enriched cassava project. Investment in this assessment is necessary to determine if the project is worth doing and should be proportional to the money at risk in the particular project and the potential for replication in other settings.

A few days of inquiry may be sufficient for such a study in planning a very small venture; as a general rule the study should cost less than 5 percent of the proposed project investment. This investment in information gathering should be made as early as possible, perhaps influencing project selection, design, and initiation. The objective should be to obtain sufficient information about market conditions and demand so that decisions can be made in the context of estimated risks. Technical performance targets and market share targets would then provide a basis for initial and subsequent investment decisions.

In Asia, ATI has depended on several capable implementing organizations to perform or be responsible for such analyses and market information gathering. Where full capability is lacking, the Asia projects have helped to transfer appropriate soft technologies, such as commercial and marketing study techniques and skills, to managers and staff in the implementing organizations. Elsewhere, and at the levels of individual productive activities, this has not widely occurred.

The allocation of additional resources to project appraisal is a question of priorities. Analysis of risks at the earliest stages of the project cycle should not require ATI to have the resources of large donors such as AID or the World Bank. Rather, ATI should be determining for the development assistance community what levels of analysis are appropriate, at what time, at what costs, and with what improvements in project planning, implementation, and evaluation as a result. This is precisely in keeping with ATI's charter to experiment with alternative delivery strategies.

4. THE TRANSFER OF SOFT TECHNOLOGY

4.1 Experimentation With Soft Technology Innovations

In addition to a core technology based on a hard technological product or process, successful and sustained operation of a productive activity depends on soft technologies. ATI describes its projects as taking an "integrated approach to project implementation. ...the delivery of that [hard] technology must take into account the 'software' needed to ensure that the technology is used effectively by the rural poor." (ATI, Appropriate Technology Bulletin, July l984).

ATI transfers soft technologies such as commercial analysis techniques, monitoring and evaluation methods, and financial accounting requirements to the project implementing organization. These as well as other soft technologies (e.g., business planning, sociocultural analysis) are transferred to the productive enterprise from the implementing organizations or other cooperating intermediaries.

ATI's most innovative, risky, yet promising efforts in soft technology transfer are those in venture capital. ATI has based a significant portion of its portfolio in Asia on organizations strong enough to manage a venture capital operation that supports specific small-scale enterprises based on appropriate hard technologies. ATI believes that the venture capital mechanism has significant potential as a means to widely replicate appropriate technologies. It has played a more forceful role in promoting venture capital than it generally has in promoting specific hard technologies.

4.2 Transfer of Soft Technologies to Productive Enterprises

ATI's efforts to transfer soft technologies to productive enterprises have not been consistently aimed at identified gaps in the capability of the enterprises. In general, ATI's Africa and Asia projects were strongest in transferring needed soft technologies to productive enterprises via the implementing organizations. In Tanzania, projects received a great deal of technical assistance in commercial and related analysis directly from the ATI project officer. His own private enterprise and financing experience and technical expertise were unhesitantly given and apparently well received. In Botswana, despite ATI efforts (including technical assistance from the Evaluation and Technology Development Group), soft technology transfer to the productive enterprises had been severely hampered by implementing organization staff turnover, illness, and accidents. The grapple-processing project in Botswana is a praiseworthy exception; the implementing organization is led by a committed "technology champion" with a special sensitivity to working with local people.

In Asia, all five implementing organizations visited were providing technical assistance and credit to the productive activities with which they were involved. An area of potential difficulty is the teaching of business management practices appropriate to the skill levels of rural-based entrepreneurs. The business planning procedures that the implementing organizations have developed with ATI assistance are generally too complex to be readily adapted for use in day-to-day management of small business operations (e.g., in the two venture capital projects in Thailand and the Philippines).

Of the Latin America and Caribbean projects, soft technology had been effectively transferred in the swine feed project but

not as yet at the wheelchair project sites visited. ATI's project officer recognized certain problems with establishing the wheelchair project productive activities in Honduras and Guatemala and discussed them with the evaluation team. One problem was the difficulty not-for-profit organizations had in adopting soft technologies that impose more business discipline. In other countries, however, ATI has been successful in getting not-for-profit implementing organizations to adopt business discipline.

4.3 Transfer of Soft Technologies to the Implementing Organizations

ATI's soft technology transfer to the implementing organizations has been varied yet unevenly applied. ATI has the funding option under the Cooperative Agreement of strengthening project implementing organizations through either small grants to implementing organizations (less than $5,000) or individual consultancies to provide specialized technical assistance. ATI assisted 4 of its 36 project implementing organizations with small grants: 2 each in Asia and Latin America and the Caribbean. It has engaged eight outside consultants: three to assist recent projects in Sri Lanka, three to consult on projects in Peru and two in Africa. The two in Africa tested the oil press production technology in the Tanzania project and the hydropowered milling technology in Zaire. Altogether, 7 of the 36 projects as of December l985 had been assisted through these two approaches. ATI reports that an additional eight small grants were awarded for projects under review and that nine consultancies were funded for development or review of projects that were under consideration or were subsequently rejected.

Prior to signing the Cooperative Agreement, ATI sought to strengthen organizations by covering the indirect costs of the implementing organization through a project grant. According to ATI, they are now unable to do this because of the requirements introduced under the Cooperative Agreement to use AID standard provisions. (This point is discussed further in Appendix I in the context of the AID-ATI linkage.

Another approach has been to transfer the needed soft technologies to the implementing organization or cooperative through the project, using other capable intermediaries or ATI staff. Soft technology transfer to the project implementing organizations in Asia has largely been successful, providing assistance where needed, introducing innovative financing arrangements, and strengthening the organizations. Technical assistance to implementing organizations in the swine feed project in the Latin America and Caribbean region was effective in achieving project objectives. This was in contrast to the soft technologies needed by, but not yet transferred to, the regional wheelchair project implementing organizations in Honduras and Guatemala. The lime kiln project has received close technical support from ATI's mineral resources expert.

In Africa, the transfer of soft technologies to the implementing organizations was generally ineffective. For example, there was little evidence that an implementing organization in Tanzania, a grant holder for three ATI projects, was an integral part of project implementation, as the ATI project officer preferred to work directly with the productive enterprises. However, the grant to the brickyard project was well designed to strengthen the capability of the implementing organization in building materials technologies, and the organization's contribution in-kind has been significant.

Transfer of soft technologies to the implementing organizations in the Botswana projects, with the exception of the grapple project, was also not successful, but for different reasons. Key expatriates in two of the implementing organizations were disabled by serious illness or accident, and the organizations' backstopping efforts were decidedly weak. Eventually, this situation could improve as a result of strong corrective actions taken by the ATI project officer in October 1985.

5. ATI'S IMPACT ON THE RURAL AND SEMIURBAN POOR

The goal of all of ATI's field projects is to benefit the poor living in rural areas or around urban areas. The evaluation team did not assess the impact of each project on intended target beneficiaries because (1) it was too early in the establishment of productive actitivites to measure benefits or costs, (2) ATI's Project Monitoring and Evaluation System focuses data collection on productive activities already underway, and (3) few baseline socioeconomic data were available. (See Appendix G for a discussion of the problems of baseline data collection.)

Nonetheless, the evaluation team used the projects' basic design, objectives, and implementation as of November l985 to determine whether a project was likely to benefit the poor. Benefits were presumed to accrue to the target group through rural and periurban-based small enterprises that (1) employ the poor, (2) provide income-earning opportunities through the provision of raw materials to the enterprises, or (3) provide benefits through the use of the technology products. Thus the team examined the likely suppliers, owners, laborers, and customers of ATI-promoted productive activities.

The Asia projects are likely to have substantial impact on the rural poor. All projects reviewed were in the agricultural product processing or agricultural waste utilization priority technical field, with direct links to rural populations. In addition, the venture capital operations are introducing to workers in the activity the innovative option of equity ownership of a portion of a productive activity. Increased attention to planning and monitoring this innovation would strengthen its chances for success and wider replication.

ATI's selection and adaptation of technologies in Asia does not involve any significant degree of participation by the target beneficiaries. In cottage-industry-level projects, this can be detrimental. In the development of small-scale industry, which forms the majority of ATI's portfolio in Asia, it would be difficult or impossible to do so. ATI does allow indigenous nongovernmental organizations full participation as equal partners in its projects and has shown considerable cultural sensitivity in this regard.

In Nepal, ATI has best ensured that projects are directed toward technologies in which low-income people are directly involved. The Thailand rhizobium project is also significant in this regard, as it is expected to improve existing productive activities of rural people by an accessible and readily transferable innovation.

In the Latin America and Caribbean region, the swine feed project may have strong positive impacts on the target population. When the appropriate feed mix is developed and the farmers learn to use and exploit it, the project will provide farmers with an "intermediate" technology at low cost. The impact of the wheelchair project has not been estimated at the levels of the producer or end-user. So far it has provided limited employment for about 12 handicapped persons. Figures on the benefits to wheelchair users are still pending.

The village oil processing project (and the related manufacture of oil presses) in Tanzania promises high returns to small farmers, especially in marginal areas that are well suited to sunflower production. The grapple-processing project is also ideally suited for the rural poor of Botswana who gather the medicinal root crop and for villagers engaged in processing for export. The Botswana lime kiln project offers similar opportunities, as local villagers are paid for gathering the limestone. The animal-driven pump project, if the appropriate technology is developed, could produce significant savings for the rural poor by providing a cheaper and more reliable water supply.

The brickyard projects in Botswana and Tanzania create direct employment in expanded brickyard operations and new enterprises. The projects otherwise are likely to have little impact on the rural poor and only marginal impact on periurban areas. The improved bricks are typically substituted for other masonry-type building materials, and thus the multiplier effects of the productive activities are difficult to estimate. End-users of the improved low-cost bricks are likely to be medium-income urban dwellers rather than the low-income workers and rural farmers. Direct employment effects may be significant if projects are eventually replicated. The ATI/implementing organization strategy in both the Botswana and Tanzania projects is to establish a market share with a better quality brick than produced in backyard kilns, at lower cost than imported bricks or the output of large modern brick factories, and with a competitive advantage over concrete blocks dependent on

increasingly costly cement.

The Kenya ceramic-lined cookstove project should have significant economic benefits for the country and should provide consumer benefits by reducing charcoal fuel cost. However, the impact of charcoal-burning stoves on Kenya's low-income rural population will be less significant because they typically burn scrap wood on open fires. However, the project has an employment impact on the rural poor, recognizing that informal sector workers, usually based in the larger urban areas, have already benefited from the spreading technology. The Government of Kenya has deliberately discouraged a large-scale pottery factory near Nairobi from producing the clay liners to encourage production by small potters.

In general, ATI's targeted groups are most likely to benefit from the field projects, but distribution effects and equity objectives are not always consistent. This has led to a seemingly contradictory evaluation of at least one project: the rural potteries project in Tanzania. The evaluation team judged the project to be both commercially viable and likely to be economically sustained, largely on the basis of the strength, drive, and innovativeness of the management of the productive enterprise which has been engaged as an intermediary in the project to produce firebricks and glazes. ATI's assessment of commercial and technical feasibility in the project plan is comprehensible and credible. Yet, a major point of concern to the evaluation team is the impact on the rural and periurban population.

The project plan provides for the urban-based and well-established intermediate producer to assist small rural potteries by supplying the firebricks and glaze to upgrade their product lines. Consumers will then have access to glazed as well as simple terra cota products. This project is thus premised on diffusion of the complementary technologies, glazing and firebricks. Based on the team's interviews with a small sample of rural potters, the diffusion process is not working well. Employment generation aspects are not likely to be significant. The intermediate producer may capture the lion's share of benefits, through ownership of the technology and direct retailing of glazed dinnerware.

APPENDIX G

HAS ATI SUCCESSFULLY MANAGED ITS FIELD PROJECTS AND ADEQUATELY SUPPORTED ITS PROJECT PARTNERS?

1. Managing field operations

1.1 ATI manages its field operations to allow for a responsive, flexible, and adaptive working style by the regional teams.

1.2 ATI's flexible and responsive approach, while very effective in some ways, has weakened its ability as an organization to identify and capture lessons learned.

2. Staff functions

2.1 ATI's organizational and staff changes under the Cooperative Agreement have improved its ability to provide technical support while employing significantly fewer staff overall.

2.2 ATI's technical specialists in the priority technical fields have been active and useful in the field.

2.3 ATI Should expand its use of independent technical advisers in project appraisals.

3. Commercial analysis for field projects

3.1 ATI's commercial analysis manual has been useful but needs to be improved.

3.2 ATI does not have a workable and tested methodology for assessing markets and developing marketing strategies which can be readily adapted to different settings, core technologies, and organizational capabilities.

4. Monitoring and information systems

4.1 ATI's financial monitoring system is working well.

4.2 ATI's nonfinancial information and documentation systems are weak and need improvement.

4.3 ATI's information and documentation reporting requirements should be simplified to eliminate duplication and less important details.

4.4 ATI's ability to implement projects and ensure future replication will depend on an improved information system.

4.5 ATI needs to improve its management, information, and evaluation systems and to reexamine its priorities to better achieve its agreed-upon objectives.

4.6 The final evaluation design proposed in the Cooperative Agreement may have to be altered.

ATI'S MANAGEMENT OF FIELD PROJECTS AND SUPPORT OF PROJECT PARTNERS

1. MANAGEMENT OF FIELD OPERATIONS

1.1 Flexible Management Style

ATI manages its field operations to allow for a responsive, flexible, and adaptive working style by the regional teams. According to ATI's Executive Director, ATI's operating style can be compared with the troubleshooting department of a large corporation. Organization members try to resolve problems by tailoring their response to the particular problem. ATI properly values a flexible direct approach internally and in working with its cooperating organizations. It nurtures a special relationship with each implementing organization. This style of managing field operations has been effective in resolving problems and bottlenecks in implementing projects. It has also been important in reinforcing a high degree of commitment and independence in its implementing organizations, as has been the case, for example, in all of the Asia projects visited. When an implementing organization has proved ineffective, ATI has terminated or modified its role in the project.

1.2 Effect of Management Style on Identification of Lessons Learned

ATI's flexible and responsive approach, while very effective in some ways, has weakened its ability as an organization to identify and capture lessons learned. A central element of ATI's approach is heavy reliance on personal actions and communications rather than on more standardized procedures and written documentation. This sometimes allows too much individual discretion by project officers on matters of project substance and timing. These officers have been learning by doing in many instances, but lessons learned are not being documented and could well be lost.

ATI's administrative procedures do not adequately document progress, project status, and critical milestones. Trip reports reviewed by the evaluation team vary widely in coverage and timeliness, yet ATI placed great emphasis on these reports and on debriefings of returning project officers. ATI does not employ explicit and consistent checklists and procedures to guide project implementation within a systematic framework for field operations management. ATI has no common basis for tracking and analyzing deviations and critical decisions taken in implementing a project. As a result, the analysis of the project implementation process -- and thus the extraction of useful lessons -- has been made more difficult. Turnover in the field operations regional staff underscores the need for such organizational guidelines.

By not following widely applied administrative practices and procedures, ATI is actually hampering the creativity of its field staff and the ability to learn and perform in a cost-effective

fashion. Managing by coping has a high cost to an organization, distracting senior management from pursuing the proactive approach necessary to achieve ATI's institutional mandate. For example, ATI points out that the lime kiln project in Costa Rica was not approved by the Executive Director until cost data were obtained on existing lime production. That fulfilling such a basic planning requirement involved intervention by the top management in ATI suggests the need for less flexibility and more detailed standard operating procedures.

ATI has made progress in developing tools to manage its project cycles. In Africa (where the ATI team is perhaps stretched too thin for what they have had to do, especially in closing down old projects), project plan requirements have been met. These plans show a definite learning curve in the application of the commercial analysis and the staging of technology development. In Asia, the tools ATI has developed for managing its projects and the subsequent replication process (project concept papers, project plans, and the project review process) have, in general, been effectively applied in the projects visited.

ATI's best developed tools now are those that focus on pre-project stages. Successful implementation of ATI's replication strategy will depend on the use of well-structured information management tools and procedures following project start-up.

2. STAFF FUNCTIONS

ATI was reorganized under the Cooperative Agreement to provide more effective support to field operations and technical assessment, evaluation, and management support to implementing organizations. A project matrix approach is used in which technical support specialists support regional teams. Grants and contracts staff monitor financial matters.

As discussed below, ATI has increased its technical staff in keeping with the Cooperative Agreement emphasis on core technology in its projects. Institutional strengthening, which characterized the majority of efforts by ATI before 1983, is now less prominent in its field program. Thus by developing a project matrix approach emphasizing more technical support, ATI has shifted its program toward hard technology demonstration, making institutional development secondary. The development of venture capital funding companies as subsidiaries of existing institutions in Asia is a notable exception.

2.1 Effect of ATI Reorganization on Technical Support

ATI's organizational and staff changes under the Cooperative Agreement have improved ATI's ability to provide technical

support while employing significantly fewer staff overall. Reportedly, the current ATI Executive Director was the first engineer hired by the organization -- in January l982, nearly 5 years after the creation of ATI. To improve the focus on the priority technical fields defined in the Cooperative Agreement, ATI replaced former generalist staff with specialists in agricultural products processing, local mineral resources, and (in July l985) equipment for small farms. These specialists -- grouped under one manager in the Evaluation and Technology Development Group -- provide technical assistance to both ATI project officers and cooperating organizations. ATI has also added a business development specialist to provide support to project officers and to cooperating organizations in setting up small-scale enterprises.

ATI has established an in-house evaluation capability with an evaluation economist, and it plans to hire a social scientist for evaluations. These staff members also support the regional planning and implementation activities and provide direct assistance to cooperating organizations in meeting the modest evaluation requirements of the project plans.

2.2 Effectiveness of Technical Specialists in Priority Technical Fields

ATI's technical specialists in the priority technical fields have been active and useful in the field. The technical specialists and ATI project officers have not hesitated to get involved in resolving technological bottlenecks and financial problems. Nonetheless, ATI's ability to assess the technical status of core technologies was hampered during the first years of the Cooperative Agreement. A visa problem grounded the mineral resources development specialist for a year. There was a long delay in Bureau for Science and Technology approval of "equipment and support for small farms" as a priority technical field, even though such projects had been initiated in anticipation of such approval. ATI should be able to avoid some earlier problems with inadequate technology assessment now that its technical specialists positions are fully staffed and mobile.

2.3 Use of Independent Technical Advisers

ATI should expand its use of independent technical advisers in project appraisals. ATI's improved technical capability is not sufficient to handle every technical issue that arises. The technological risks in many of ATI's projects should have been identified by independent advisers. Seldom were independent technical experts asked to assess the state of the art or the potential payoff from a technology as a cross-check on the assessments made by experts from the implementing organization or ATI. Such assessments would form a useful baseline for managing and evaluating the projects.

3. COMMERCIAL ANALYSIS FOR FIELD PROJECTS

3.1 ATI's Commercial Analysis Manual

ATI's commercial analysis manual has been useful but needs to be improved. Published in November l983, the Manual for Commercial Analysis of Small-Scale Projects (Jackelen l983) was a product of ATI's small-enterprise focus. The manual was tested by field officers and used in ATI project planning. For its limited purpose, the manual is well written and it has been favorably received by the development assistance community.

The manual uses break-even analysis for determining the financial viability of an enterprise. It was not designed as a guide for financial or economic rates of return. The break-even analysis is used to answer the question: "at what level of production will the product cover all its fixed and variable costs?" (Jackelen l983, 27). The final analysis calculates the net cashflows of the project to estimate how long it will take "to get the project operational and the time required to reach the break-even point" once the project is in operation (p. 43).

The break-even level of capacity utilization is but one long-standing criterion for commercial analysis of business ventures; its use of undiscounted measures of project worth can distort the investment picture in some circumstances.

ATI staff specialists and project officers have found the commercial analysis manual to be useful but incomplete. As a result, ATI's Evaluation and Technology Development Group has been promoting approaches based on financial statements, ratio analysis (Helfert 1982), and business plans. ATI project officers have already begun using these more sophisticated techniques in recent project plans. A series of training seminars were held in 1985 to introduce the concepts to project officers; those who could not attend because of travel conflicts could view the sessions later on video tape. Although an in-house evaluation questionaire indicated that the effort was well-received, the training materials would benefit from inclusion of more direct examples from ATI projects and from simplification of the formats.

ATI recognizes the need to improve its commercial analysis manual but has not devoted the necessary resources to have it revised, field tested, and disseminated for wider critical review. Revising the manual, or at least preparing more formal guidelines, ought to be a priority task for ATI, not only to provide a more consistent approach and avoid some of the deficiencies in project analysis (cited in Appendix F), but also to fulfill ATI's stated mission of widespread dissemination of successful strategies.

3.2 Methodology for Assessing Markets and Developing Marketing Strategies

ATI does not have a workable and tested methodology for assessing markets and developing marketing strategies which can be readily adapted to different settings, core technologies, and organizational capabilities. The ATI commercial analysis manual focuses on production process costs, financing, and capacity. ATI's supporting guidelines need to be more balanced to assess the risks and uncertainties of the market in ATI demonstration projects. For example, the two productive activities in operation in the Asia region as of November 1985 were wool spinning in Nepal and bamboo grass mats in Thailand. Both are based on satisfying an established market demand. Each faces distinct problems in doing so.

-- The bamboo grass mat enterprise has considerable experience in marketing its product. Its production, however, meets a very large share of total world demand, and so expansion or replication will depend on developing alternative uses or markets, for which neither the implementing organization nor ATI has yet provided technical assistance.

-- The wool spinning enterprises have little or no experience in marketing their product. The implementing organization has realized that this is a problem but has not yet addressed it.

The approaches ultimately developed and disseminated should tie into any evaluation forms used. The Project Monitoring and Evaluation System format is not linked to either the commercial analysis manual or the recent seminar materials.

4. MONITORING AND INFORMATION SYSTEMS

4.1 ATI's Financial Monitoring System

ATI's financial monitoring system is working well. ATI had planned to implement a computerized grants monitoring system, but decided against it. The manual grants monitoring financial procedures were not examined by the evaluation team. By all accounts they are working satisfactorily.

ATI has responded well to concerns raised prior to the Cooperative Agreement about the supervision of grant funds. Among ATI's criteria for working with an implementing organization is its ability to handle funds and implement donor-assisted projects. When there has been doubt, independent accounting firms have been engaged as part of the project implementation plan. ATI's response to reporting requirements specified in the Cooperative Agreement or in implementation letters from the Bureau for Science and Technology has also been satisfactory (see Appendix I).

4.2 Nonfinancial Information and Documentation Systems

4.2.1 Need for Improvement

ATI's nonfinancial information and documentation systems are weak and need improvement. ATI's project monitoring and field management could be improved by making the following changes:

- -- Establishing one centralized file for each project, instead of the present scattered system of filing{1}
- -- Developing an improved tracking mechanism to identify progress and accomplishments in project stages before the productive activities are established
- -- Using basic project implementation technologies that show critical dependencies among project activities and balance time against available resources

For example, use of a network scheduling technique based on PERT or CPM could benefit ATI. ATI could adapt the soft technology to its own project ventures and evaluate its appropriateness for transfer to cooperating partners.

ATI uses field trip reports to provide a written record of project supervision issues. Starting in January l986, the reports will have a common format modeled on the Africa region manager's report format, and they will have to be submitted on a more regular schedule. Use of a tracking mechanism will help in extracting lessons across technical fields, regions, implementing organizations, and project officers. Both progress and completion of essential implementation steps ought to be more carefully reported, and the information consolidated and monitored so that inevitable problems can be systematically discussed. Network scheduling techniques provide one means of "visible control" among otherwise independent regional operations.

{1}The evaluation team found three formal sets of files for each project: one in the grants administration office, one in the region, and one in the Evaluation and Technology Development Group. In addition, the Director of Field Operations kept personal files on the status of the projects.

4.2.2 Need for Simplification

ATI's information and documentation reporting requirements should be simplified to eliminate duplication and less important details. The evaluation team believes that ATI field staff should not be burdened with excessive requirements to report to headquarters. For example, the annexes to the annual Workplans contain numerous and seemingly repetitious tables on all ATI grants, including those started before the Cooperative Agreement,

prepared at the request of the Bureau for Science and Technology. ATI should review all present requirements in consultation with selected implementing organizations with the goal of retaining only reports essential for monitoring progress and learning from demonstration projects. Any AID reporting requirements should be justified from a zero base as essential to the intent of the Cooperative Agreement, including its amendments. In addition, the reporting requirements of the ATI board and AID management, which are separate and distinct, should be more closely aligned for period and content; ATI estimates that this would save almost 1 person-year for the program.

4.2.3 Effect on Project Implementation and Replicability

ATI's ability to implement projects and ensure future replication will depend on an improved information system. ATI's Project Monitoring and Evaluation System is neither a monitoring system nor a useful evaluation tool. Clearly, much effort went into its design and the comprehensive 17-page questionnaire. Unfortunately, the system provides an essentially static description of each demonstration project. The system provides no information on progress to date or on expected achievements based on explicit implementation efforts.

A sampling of ATI project officers indicated that they consider the Project Monitoring and Evaluation System to be useful to the Evaluation and Technology Development Group but not to their own field operations. By design, the system was not meant to be primarily a tool for routine monitoring of activities by project officers. To make the Project Monitoring and Evaluation System more relevant to field operations, it should be tied to revised commercial and market analysis guidelines and to a network scheduling and reporting system.

ATI needs to learn from its successes and failures in promoting an appropriate technology process and to be able to share its findings. This is especially important in the soft technology area, where ATI's comparative advantage lies. It should be able to develop and experiment with its own evolving technologies for promoting appropriate technological changes in the small-scale enterprise sector. Hence, its Project Monitoring and Evaluation System should document decisions taken in the course of project or technology development with a view to enabling ATI to strengthen its soft and hard technology transfer capabilities. A simpler set of entries is needed which lend themselves to routine updating by the project officer involved.

4.3 Management and Evaluation Systems and Priorities

ATI needs to improve its management, information, and evaluation systems and to reexamine its priorities to better achieve its agreed-upon objectives. ATI has repeatedly argued

that any changes must be considered within the context of its resource constraints and must be cost-effective. For example, additional work on evaluation is constrained by limitations on staff time; further documentation requirements are not justified in an organization of ATI's size; additional project planning analysis is unwarranted because it will not reduce the risks nor ensure that all problems will be anticipated. Although reasonable, these arguments do not go to the central issue of what is needed to achieve and document ATI's objectives. A change in ATI's priorities toward more systematic concentration on identifying, capturing, and using lessons learned to achieve its basic objectives should be considered.

ATI has been successful thus far in allocating over half its budget to grants, as required by AID in the Cooperative Agreement (see Appendix D). It may be necessary to relax this requirement temporarily to allow additional staff time to be devoted to implementing the replication strategy and responding to these recommendations.

As part of the 50-percent target for grants, the evaluation team proposes that ATI consider making a greater effort to include the transfer of monitoring and evaluation skills in each grant as a management tool for the grantee. While some provisions have been made for this in project designs, more consistent effort is appropriate. This also is an area for continued experimentation. Evaluation staff of the Evaluation and Technology Development Group (the manager and evaluation economist) have spent considerable time in the field and working with project officers to assist them and cooperating organizations address evaluation responsibilities. Specialized outside technical assistance can supplement these efforts as part of each grant.

4.4 The Cooperative Agreement Project Evaluation Design

The final project evaluation design proposed in the Cooperative Agreement may have to be altered. The Cooperative Agreement calls for ATI to collect baseline data on 10 designated projects to allow for assessment of the impact on the incomes, savings, employment, and welfare of the poor. ATI has defined the target groups as those directly affected by each of the 10 designated projects, deemphasizing forward and backward linkages as factors in assessing project impact. The productive activities in the projects visited were either not yet started or only recently underway. Data collection efforts were in a similar state. Thus, ATI will not assess the broad impact of their projects on the poor in project areas by the end of the term of the Cooperative Agreement. The evaluation design should be altered to reflect the activities that ATI plans to undertake -- a plan supported by many people, including AID evaluation staff consulted in the Center for Development Information and Evaluation.

APPENDIX H

WHAT ARE ATI'S LONG-TERM AND REPLICATION STRATEGIES AND CAN THEY BE IMPLEMENTED?

1. ATI's long-term strategy

   1.1 ATI's long-term strategy analyzes the key links in the technology development and delivery system chain.

   1.2 The three phases of ATI's long-term strategy are unrealistically ambitious.

   1.3 ATI's long-term strategy calls for distinct regional approaches, based on a generally sound appraisal of opportunities and problems in each region.

   1.4 ATI has given too little attention to several strategic outputs of its 1985 long-term strategy and Workplan.

2. ATI's replication strategy

   2.1 The implementation of the replication strategy is a departure for ATI from its mandated style of responding to local needs.

   2.2 The core technologies of ATI's projects are generally replicable, but more attention must be given to the supporting adaptation needed in each local setting.

   2.3 ATI has not yet paid sufficient attention to (1) systematically identifying innovative elements, (2) establishing their relationship to other project elements and to phases of planning and implementing projects, and (3) systematically examining the lessons that might be learned and disseminated.

   2.4 ATI and the AID Bureau for Science and Technology should consider a more flexible, less specified approach to replication and dissemination.

ATI'S LONG-TERM AND REPLICATION STRATEGIES

1. ATI'S LONG-TERM STRATEGY

1.1 Focus on Links in the Technology Development and Delivery System

ATI's long-term strategy analyzes the key links in the

technology development and delivery system chain. Soon after the Cooperative Agreement went into effect, ATI's Board of Trustees began to focus attention on a long-term strategy for ATI. This long-term strategy was finally presented, after six iterations with the AID Bureau for Science and Technology, Office of Rural and Institutional Development, in ATI's Workplan for 1985. Over the short life of the Cooperative Agreement, ATI's long-term strategy has evolved and has become more focused.

The long-term strategy in ATI's workplan for 1985 describes ATI's focus in the following areas: ATI's role in developing countries, the various types of institutions with which ATI works, the need for a balance between hard and soft technologies, and the need for a sociotechnical systems approach. ATI believes that all parts of the technology delivery-system must be addressed, so its long-term strategy analyzes all the groups in the chain of technology delivery.

1.2 The Three Phases of ATI's Long-Term Strategy

The three phases of ATI's long-term strategy are unrealistically ambitious. The long-term strategy describes three phases ATI expects to undergo over a 6-year period -- a consolidation phase, a replication phase, and an expansion phase. For each of these phases ATI describes program and project activities, policy and information activities, and funding and staffing.

The replication phase, which began in January 1986, is premature given the actual progress in demonstrating productive activities. ATI's projections on how quickly its projects can bring core technologies to commercial viability has been too optimistic. This, together with deficiencies in assessing the stage of development of the technology, has led to an unrealistic schedule for beginning replication activities (see Section 2).

1.3 Regional Distinctions

ATI's long-term strategy calls for distinct regional approaches, based on a generally sound appraisal of opportunities and problems in each region. Africa is to have smaller projects focused on "single themes" -- demonstration of either a technology process or a technology product. Because of the dearth of implementing organizations who can work on ATI's terms, it seems realistic to limit the scope of the projects. However, ATI must take care not to overburden the few implementing organizations with which it presently works with multiple projects, all of which have to be handled separately.

The Asia program strategy notes the advantage of having many implementing organizations from which to select in areas of technology development, community and economic development, and

business and technical services. ATI's strategy has been to bring together various actors to counter the generally fragmented approaches to appropriate technology development and transfer that have been characteristic in Asia. This approach seems sound and seems to be based on the experience of its Thailand and Nepal programs.

The Latin America and Caribbean program calls for concentrating on poorer countries in the region. Replication projects will be the main theme. However, the poorer countries are more likely to need a complete package of well-adapted interventions, that is, demonstration projects that adapt both hard and soft technologies to the particular setting.

1.4 Attention to Strategic Outputs

ATI has given too little attention to several strategic outputs of its 1985 long-term strategy and Workplan. The long-term strategy and 1985 Workplan outline the task of developing a framework for extracting lessons to be shared with key actors in the development assistance community. ATI's policy program was to have been established in 1985 with the main objective of developing ATI's capacity to learn from its experience and to translate this experience into meaningful advice for key actors in the development arena. This has never been carried out. Neither have other 1985 Workplan outputs, including the following:

-- Quick and dirty methods of extracting market information

-- Quality and product safety guidelines for productive enterprises

-- A revised field manual for commercial analysis of projects

The 1985 Workplan also discusses broadening ATI's funding base through a venture capital fund in which ATI would take an equity position to provide risk capital to ventures it has been working on for several years. The intent is to have a catalytic effect on other investors and provide ATI a degree of management leverage.

The 1986 Workplan deemphasizes nearly all these points and projected outputs. ATI's response is that other matters have had higher priority given budgetary cutbacks and staff limitations; for example, considerable effort has gone into developing the replication strategy, discussed in the following section. Furthermore, not all ATI staff supported these key outputs. For example, ATI's business specialist at the time (he has since resigned) did not place a priority on revising the field manual for commercial analysis.

2. ATI'S REPLICATION STRATEGY

2.1 Development of the Replication Strategy

In September, 1985 the Cooperative Agreement was substantially amended to incorporate a section on replication, largely in response to recommendations made in a report of an audit of ATI's operations from June 1984 through February 1985.

This amendment defines replication and establishes specific objectives and measurable performance criteria for evaluating its success. A further recommendation -- calling for a definitive statement of the roles of the Bureau for Science and Technology and ATI for achieving replication by others -- has not yet been implemented.

Based on this framework, ATI elaborated its long-term strategy and added, as requested by AID, a replication strategy, which is presented in the Annual Workplan for 1986. ATI and the Bureau for Science and Technology compromised on the following objective for replication:

> Replication, in the context of ATI's Long-Term Strategy, is dissemination or diffusion of the innovative element(s) of a successful appropriate technology project of ATI beyond the objectives and implementation plan of the original project (ATI 1986, 9).

2.2 Change in Focus Required by the Replication Strategy

The implementation of the replication strategy is a departure for ATI from its mandated style of responding to local needs. Development and dissemination (here meaning the widespread use of a given technology within the region of its development or adaptation) start with the identification of a local need by a potential implementing organization. Replication starts with a tested potentially profitable innovative element of a hard or soft technology.

The replication strategy "pushes" hard technologies once they are shown to be commercially viable. This supply-oriented emphasis diverts ATI's focus from identifying and meeting needs of the rural and semiurban poor through the demonstration of successful technology delivery strategies. The danger with this new approach is its overemphasis on hardware elements (e.g., maize mills and wheelchairs) to the neglect of innovative soft technologies necessary for successful adoption and sustained utilization of the technologies in new settings.

ATI, in the replication addendum to its long-term strategy, has noted the importance of maintaining a local-conditions-oriented

approach in its replication activities as well as in its technology testing and demonstration activities:

-- ATI's Replication Strategy deals with the dissemination of technologies and not simply the dissemination of tested information or the dissemination of machines or devices.

-- Just as ATI's demonstration projects are attentive to local conditions, needs, and resources which affect the use of a technology (and help determine its appropriateness), so will ATI's replication activities concern themselves with necessary adaptations in technology design and use in response to local conditions. In other words, ATI's Replication Strategy calls for local adaptations of technologies tested in ATI's demonstration projects (p. 324).

ATI has not yet developed the means for so tailoring its replication efforts consistently as the following sections illustrate.

2.3 Emphasis on Core Technologies for Replication

The core technologies of ATI's projects are generally replicable, but more attention must be given to the supporting adaptation needed in each local setting. The assessment of the replicability of the projects was based essentially on the technical and commercial feasibility of the core technology and the potential for transfer to another setting. Core technologies in most productive activities were replicable in this very narrow sense, leaving aside the issues of who might be engaged in replication and what degree of effort would be required.

Two of ATI's projects that provide insights into technology diffusion and replication show the importance of supporting aspects beyond the core technology itself. The Kenya ceramic-lined cookstove project is actively dispersing the liner manufacturing technology; the prospects for replicating the productive activity are good, largely because of the dynamic entrepreneurial climate in Kenya. ATI's cooperating organizations are actively engaged in transferring the technology to established enterprises, ensuring quality and helping to develop the market for quality cookstoves.

The second project, the regional wheelchair project in Latin America and the Caribbean, is an explicitly designed effort to transfer the technology package (in this case an easily portable wheelchair) and its local manufacture using a standard kit. Although ATI considers it a "parallel demonstration project," rather than a "replication project", it nonetheless indicates the promise and problems of replication-type projects.

The wheelchair project builds on a project that began prior to 1983 and was carried over into the Cooperative Agreement as a truly unusual development opportunity (i.e., it was not one of the three priority technical fields). Even given that the implementing organizations at the two Central American sites signed contracts only in July l985, the lack of progress in the basic planning of the project as of November l985 was striking. The implementing agencies had no business plans, no commercial analysis, and no information on the market, such as the availability of imported wheelchairs and the government or other donor subsidies involved. ATI's generic calculations for the regional project plan had not been modified appropriately for the sites visited. The cooperating organizations for the wheelchair project were primarily welfare- and rehabilitation-oriented agencies, and ATI had been unable to work out arrangements with them to move into productive activities.

Based on its visits, the Latin America and Caribbean evaluation team was highly critical of ATI's wheelchair project implementation efforts. ATI cites successful wheelchair production enterprises underway in several South American countries, some spontaneously started, others tied to ATI's regional project, but the evaluation team was unable to visit these to verify actual progress or the viability of these enterprises. ATI's regional project status report of January l986 is not encouraging, citing implementing organization weaknesses in Peru and Colombia. ATI senior management appears to have recognized past shortcomings in implementing this project by recently assigning a departing staff member to a consultancy to rectify them. Still, questions are raised about ATI's capabilities to follow through on replication.

The replication prospects for the core technologies in four projects with technologies still under development were rated highly: coconut processing and rhizobium production in Asia and brickyard technologies and village oil processing in Tanzania. Six projects were assessed as having fair prospects of replicability, and the team was neutral on four projects. The replicabilities of bamboo grass mat fabrication in Thailand, the animal-driven pump project in Botswana, and the oil press manufacture in Tanzania were questionable, for technical and/or marketing reasons. The rural potteries project in Tanzania was not considered replicable because it depends on several elements unique to that setting: an exceptionally motivated entrepreneurial family -- ethnically different from those in the market -- which owns diverse supporting enterprises in a business-government climate that is complex and impenetrable to outsiders.

However, as ATI notes, the replication potential (not replicabilities) should not be measured solely in terms of core hard technologies, for example, the bamboo grass mats fabrication venture in the Thailand rural small-scale industries project. In this case, replication pertains to the innovative elements of the venture capital strategy and the use of a central processing and distribution facility combining the organizing strengths of a major community development association with the private sector

initiatives of Thai businessmen.

2.4 Ability To Extract and Disseminate Lessons Learned

ATI has not yet paid sufficient attention to (1) systematically identifying innovative elements, (2) establishing their relationship to other project elements and to phases of planning and implementing projects, and (3) systematically examining the lessons which might be learned and disseminated. Most innovations identified by ATI in its projects have to do with hard technologies. However, a successful demonstration project should produce lessons that go well beyond the technical parameters of the development and utilization of a project's core technology. These lessons will have to draw on further experiments with ATI's selected delivery innovations, such as franchising and venture capital financing, and with other modes of soft technology transfer.

A significant constraint on ATI's ability to implement a replication strategy may well turn out to be its own documentation system. ATI's Project Monitoring and Evaluation System provides an essentially static description of each demonstration project (see Appendix G). Because ATI must learn from its successes and failures in promoting each appropriate technology process in order to be able to share its findings, the system should document decisions taken in the course of project, technology, and market development. Fitting the information gathered for the evaluation into the replication framework is a first step. ATI management recognizes the need to revise the Project Monitoring and Evaluation System to meet the requirements of its new long-term strategy.

2.5 Need for More Flexible Replication and Dissemination Strategies

ATI and the AID Bureau for Science and Technology should consider a more flexible, less specified approach to replication and dissemination. More discretion should be given to ATI in implementing replication and dissemination. Accountability for replication should be proportional to ATI's larger program.

ATI's mission statement clearly placed a joint emphasis on successful demonstration of appropriate technologies and widespread dissemination of the results. The emphasis on replication is an overcompensation by AID and ATI to the l985 Inspector General's report. The audit team erred in latching onto one theme (accountability for replication) and subsequently disputing both AID and ATI responses, which should have clarified the auditors' concerns. Nonetheless, the response to this aberrant line of criticism has been a major amendment to the Cooperative Agreement, including the preparation and negotiation of a replication strategy which is too precise in its

specifications, apparently to ensure indisputable indicators of accountability.

The replication strategy yardsticks and specifications will place even greater emphasis on replication of core technologies to the detriment of testing and disseminating successful and innovative delivery strategies and supporting technologies, that is, the broad range of innovative activities and risk taking that was the basis for ATI's establishment by the Congress. This hard technology focus may be inevitable, as pressure mounts to produce appropriate technology (meaning the hardware) success stories to justify future budget allocations. Furthermore, the ATI-AID response to the 1985 Inspector General's report has demanded considerable time and effort from senior management of ATI and the AID Bureau for Science and Technology and has opened up additional areas for disagreement and compromise over terminology and definitions in the Cooperative Agreement amendment process. These issues are explored further in the context of the ATI-AID linkage, evaluated in Appendix I.

APPENDIX I

IS ATI'S LINKAGE WITH AID ACHIEVING ITS INTENDED OBJECTIVES

1. The Cooperative Agreement gave AID much more influence over ATI than did the previous grant.

2. ATI's budgetary support

   2.1 Despite a clear pattern of declining budget support from the Bureau for Science and Technology, ATI and AID have not yet been able to diversify the sources of funding.

   2.2 ATI has not yet been successful in getting direct support from USAID Missions nor other sources, nor has it elicited their support for joint ventures.

3. Guidance under the Cooperative Agreement has helped improve ATI's project planning, approval, and financal control, but at the cost of inhibiting its mandated experimentation with innovative approaches, particularly in financing.

4. ATI and AID need to strengthen ATI's linkages with AID beyond the Bureau for Science and Technology and other AID/Washington offices.

5. The Bureau for Science and Technology oversight of ATI has required substantial amounts of staff time in both

organizations; oversight should be limited and redirected.

ATI'S LINKAGE WITH AID: IS IT ACHIEVING ITS INTENDED OBJECTIVES?

1. INCREASED AID INFLUENCE OVER ATI

The Cooperative Agreement gave AID much more influence over ATI than did the previous grant. The program description of the Cooperative Agreement describes ATI's activities in three areas: field operations, subproject support, and general program support. In ATI's opinion, the Cooperative Agreement goes into excessive detail and unduly dampens ATI initiatives. It puts ATI in a position of continual AID oversight by the Bureau for Science and Technology (S&T). This is ironic, given that ATI was established because of a strong desire by the Congress to create an autonomous alternative to AID-type development assistance (U.S. Congress 1977, 17). However, AID oversight does not extend to ATI's day-to-day operations. Its influence and effective control are exerted through budgetary allocations and approval of annual workplans, which are discussed in turn in the following sections.

2. ATI'S BUDGETARY SUPPORT

2.1 Diversification of ATI Funding Sources

Despite a clear pattern of declining budget support from the Bureau for Science and Technology, ATI and AID have not yet been able to diversify the sources of funding. ATI's present and proposed budgets were presented in Table C-1 in Appendix C. The obligation for 1986 is 41.5 percent of the implied $5.5 million annual commitment rate, and proposed budgets for 1987 and 1988 are 34.2 and 31.8 percent, respectively.

The l982 AID evaluation stressed that ATI should find other sources of funding, including direct arrangements with the USAID Missions. The declining S&T allocations to ATI, at a time that the Bureau's overall allocation is also declining, were a clear signal that ATI should have developed other sources of support. AID senior management has also indicated that the present funding levels not only cannot be maintained, but will probably decline in the climate of Gramm-Rudman budget cuts. ATI and S&T have been considering alternatives that will allow some respite from the obviously eroding level of central AID bureau financial support. However, ATI senior management has drawn on support from the Congress to maintain and expand its operations.

The evaluation team believes that ATI should not consider expanding operations nor replacing departing staff (with the exception of regional teams and technical specialists) until a clear commitment has been made for funding support under the Foreign Assistance Act, or until alternative sources are

confirmed.

To date ATI has been successful in developing one alternative funding source, a subcontract on the ARIES project, which, incidentally, is funded by S&T.

2.2 Support from USAID Missions

ATI has not yet been successful in getting direct support from USAID Missions nor other sources, nor has it elicited their support for joint ventures. There is reportedly demand for ATI's services from some Missions (Thailand, India), but the evaluation team has no independent verification of this demand, or the level of support to be funded. Direct use of ATI's services by USAID Missions has been inhibited by competitive bidding requirements. Progress by S&T on an ordering agreement to facilitate this funding mechanism has been slow.{1}

Efforts by ATI to get funding from other sources, such as foundations or transnational corporations that are unable to repatriate funds from developing countries, have not yet been successful. ATI cites its association with AID as an inhibiting factor in gaining U.S. private sector corporation and foundation support. These entities reportedly see ATI as a government supported organization, not as an autonomous agency.

{1}The ordering agreement has not yet been signed, as of December 1986.

3. EFFECTS OF AID OVERSIGHT ON ATI'S FULFILLMENT OF ITS MISSION

Guidance under the Cooperative Agreement has helped improve ATI's project planning, approval, and financial controls, but at the cost of inhibiting its mandated experimentation with innovative approaches, particularly in financing. Major changes in ATI management and staffing and in S&T technical management have led to improved controls. Yet, government regulations reduce flexibility. The requirement to use the AID standard provisions in contracting with cooperating organizations is one of the most troublesome issues for ATI under the Cooperative Agreement. This requirement held up the signing of the Cooperative Agreement and has resulted in extensive negotiations before and since.

ATI values its special relationships with developing country organizations and does not wish to be seen as an agent of AID programming in the country, because of, among other aspects, the strings that AID and Congress attach to disbursal of U.S. Government funds. ATI has great confidence in the ability of its project officers to assess institutional capability and commitment

and to take corrective action swiftly if the integrity of ATI-financed operations are in question. The evaluation team saw strong evidence to support the latter, when the Africa regional manager acted quickly to correct one implementing organization's careless accounting of project funds in Botswana.

Prior to the Cooperative Agreement, ATI's judgment and practices with regard to grants for its projects had been questioned. However, the evaluation team found that ATI has significantly improved its project planning and approval process and instituted more careful financial controls over grants implemented under the Cooperative Agreement. Guidance under the Cooperative Agreement may have brought about these changes, but perhaps at the cost of inhibiting ATI's experimentation with alternative approaches and restricting the range of ATI's soft innovations, such as new financial arrangements with implementing organizations.{2}

ATI no longer includes any part of the overhead costs of implementing organizations in project grants because they would be required to undergo the time-consuming process of formally negotiating an overhead rate. Perceptions of the degree of hindrance this causes the ATI program differ between ATI and the Technical Manager of the S&T Rural and Institutional Development Office (RD). The latter has been trying to cast the standard provisions in the best light for ATI activities, given the requirements of AID financial management and contracts. ATI views this as burdensome, bureaucratic red tape, not applicable to the kind of quick-disbursing project cycle they value.

A second example is ATI's ability to leverage lending by local financial institutions through loan guarantees. The obligation and disbursement process would require ATI to deposit funds covering the guarantees in a U.S. account, thus losing its leverage: if the funds cannot be invested for other purposes, then why not disburse the entire amount to the implementing organization?

A third issue, much more complex, is ATI's desire to take an equity position in several ventures (e.g., in Sri Lanka and Indonesia). ATI sees this as an opportunity for management leverage in investment decisions; ATI's Board has given permission for ATI to pursue this financial arrangement; the S&T/RD Technical Manager is concerned about ATI, and indirectly AID, liability for the enterprise's financial management.{3}

{2}It did not, however, prevent ATI from going forward with its venture capital projects in Asia.

{3}ATI was reportedly negotiating with the Private Enterprise Bureau of AID on a loan guarantee program.

4. NEED TO STRENGTHEN ATI'S LINKAGES WITH USAID MISSIONS

According to ATI, the Cooperative Agreement regulates ATI's relationships with AID operational units. ATI has to inform USAID Missions of its presence in the country by commercial cable 10 days before a staff member's intended arrival, although no Mission approval is required for ATI staff travel. The evaluation team finds this to be more of an opportunity than a hindrance. ATI should establish and nurture working relationships with USAID Missions in the countries in which ATI operates. As the opportunities arise, ATI should go beyond observing the courtesies of travel notification to assist Mission staff in project and programming efforts.

ATI and USAID Missions have complementary interests and contrasting efforts; they could learn more from each other, but communications must first be improved. AID and ATI have complementary projects (e.g., in the Dominican Republic, Kenya, Tanzania) in which the ATI core technology complements technological changes started under larger AID programs. Their contrasting approaches (e.g., rhizobium in Thailand, coconut processing in Philippines) result from a different scale of process or alternative process technologies. Occasionally, ATI and USAID Missions have provided complementary soft technology support to an organization (e.g., in Indonesia, Botswana).

Nonetheless, improving communications should lead to greater mutual awareness of common interests in many countries. All involved, including S&T staff, need to improve communication and collaboration in the field. The S&T/RD Technical Manager toured the ATI project countries in Africa and Asia in January l985, visiting the Missions to explain and promote ATI's capabilities. Since the beginning of l986, ATI has been pursuing a deliberate strategy of improving its linkages with USAID field Missions as part of its participation with the ARIES project. The activity requires strong support from S&T.

5. NEED TO LIMIT AND REDIRECT AID OVERSIGHT OF ATI

Bureau for Science and Technology oversight of ATI has required substantial amounts of staff time in both organizations; oversight should be limited and redirected. The special circumstances under which ATI was originally created, the mixed reviews of its performance in the initial years under the grant, and the long negotiations establishing a new Cooperative Agreement with AID have created a sometimes tense climate between ATI and S&T. This has made the technical management of the Cooperative Agreement a complex and difficult task, requiring substantial amounts of staff time. The evaluation team examined the ATI-AID link from the perspective of both the Executive Director and senior managers of ATI and the S&T/RD Technical Manager and his supervisors.

The S&T/RD Technical Manager estimates that administration and routine management has taken 35-40 percent of his time; the paperwork associated with ATI's activities has been considerable.

For example, ATI has had to request waivers for the procurement of vehicles for particular projects because the blanket waivers provided at the time the Cooperative Agreement was signed have not been sufficient. Delays in this process directly affect the implementing organizations ability to carry out project work according to plan. The lengthy clearance process within AID reportedly requires nine signatures from various offices, a significant bottleneck.

The S&T/RD Technical Manager estimates that negotiating with and on behalf of ATI takes 35-50 percent of his time. For example, the negotiation for the Cooperative Agreement required more than a year, involving the Congress as well as AID and ATI. One week after the Cooperative Agreement was signed (September 30, 1983) ATI petitioned to add a third priority technical field: Equipment and support for small farms. Formal approval was not given until the end of March l985. The delay was not due to bureaucratic red-tape, but rather to S&T resistance to the requested addition. Overall, the negotiating process, which often has taken the form of repeated drafts of documents submitted by ATI to S&T, has been too extensive.

The date of first submission, number of submissions, and date of final approval for key documents are shown in Table I-1. The approval pattern indicates an improving trend. However, during the first years of the Cooperative Agreement, the senior management of ATI devoted far too much time to negotiating with S&T, perhaps to the detriment of establishing a broader dialogue with AID regional bureaus.

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Table I-1. AID Approval of ATI Activities

Document Originated by ATI	Date First Submitted to AID	Number of Drafts	Date of Final AID Approval[a]
l984 Annual Workplan	9/30/83	12[b]	3/29/84
Equipment and Support for Small Farmers Proposal	10/07/83	7	3/28/85
1985 Workplan and Long-Term Strategy	9/14/84	6	3/28/85
1986 Workplan and[c] Replication Strategy	8/23/85 7/08/85	3 3	Pending[d] Pending[d]

aFormal written approval.
bSeven documented submissions.
cOriginally planned for joint approval, now being reviewed

separately.
dPending as of May 1986.

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The repeated inquiries into ATI's performance also have required significant staff time for a relatively small organization. According to ATI, the AID Inspector General's Audit that began in June 1982 (final report issued April 1983) required 1,600 hours of ATI staff time. The audit that began in June 1984 (final report issued March 1985) required "considerable additional time to support the 4,000 hours of AID work on the audit. As of March 1985, ATI had spent 3,000 hours in support of this evaluation." (Memo from DeWilde [ATI] to Delp, 03/13/86).

Time spent negotiating with S&T has been time lost for other key management concerns, such as promoting substantive linkages between ATI and other AID bureaus and the field Missions. The evaluation team recommends expanding the number and quality of contacts between ATI and AID staff through project officer-level meetings addressing problems of mutual interest.

S&T oversight, in light of its successful role in assisting ATI to redirect and focus its operations, should follow a more detached mode, based on management by exception. The primary emphasis would be to assist ATI in overcoming procedural bottlenecks to achieving its experimental role. ATI and AID need to make diversification of funding sources a priority objective.

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